PERMANENT FILE
LITERATURE
Return this copy to
Advertising Division
Ingersoll-Rand
Phillipsburg, New Jersey
File
X-1850 2M 10-54
PRINTED IN U. S. A.

Compress

AUGUST 1951

TRIPLE-COLOR SPRAY PAINTER

Air-operated rotary table applies coatings to 1200 plastic toys an hour

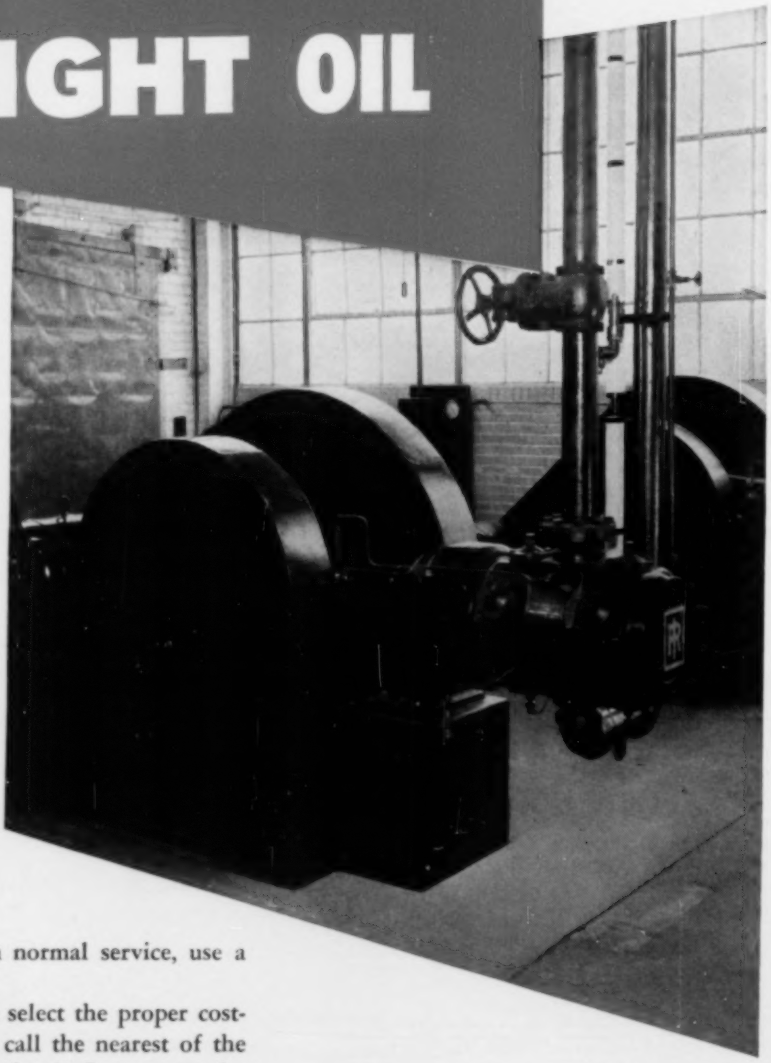
(SEE INDEX PAGE)

VOLUME 56 · NUMBER 8

NEW YORK · LONDON

DON'T GET "LEFT"

—USE THE RIGHT OIL



There's a Texaco air compressor oil EXACTLY RIGHT for your operating conditions

You won't get "left" with high maintenance costs when your air compressors are lubricated with Texaco. Regardless of compressor type or size, or what operating conditions you have, there is a Texaco air compressor oil exactly right to assure clean, low-cost operation. For example —

★★ To overcome excessive wear due to wet cylinder conditions, use a Texaco *compounded* air compressor oil.

★★ To eliminate harmful carbon and gum formations in severe service, use a Texaco *heavy-duty* air compressor oil.

★★ To keep compressors and systems rust-free, whether in service or idle, use a Texaco *rust-inhibited* air compressor oil.

★★ To keep compressors clean and efficient in normal service, use a Texaco *straight mineral* air compressor oil.

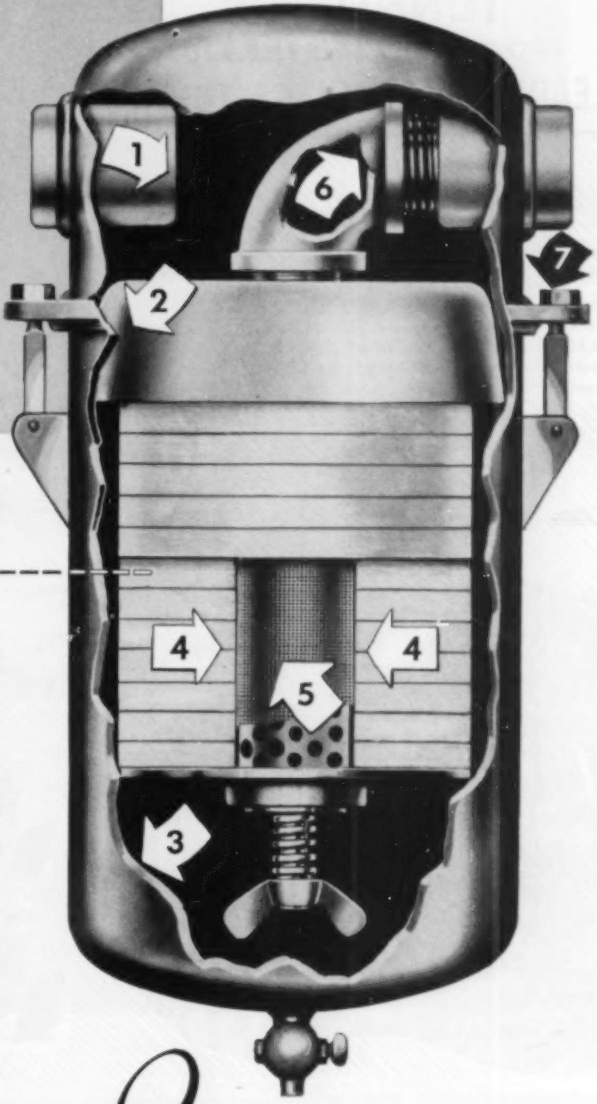
Let a Texaco Lubrication Engineer help you select the proper cost-reducing lubricants for your compressors. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

TEXACO

TEXACO Air Compressor Oils

FOR ALL OPERATING CONDITIONS

Removes Last Traces of Oil and Moisture from *COMPRESSED AIR LINES*



THICK FELT DISCS PROVIDE SUPER FILTRATION

DOUBLE ACTION PRINCIPLE REMOVES MOISTURE AND DIRT TWO WAYS—Here's the greatest pipe line filter ever developed for removal of every trace of foreign matter, condensed oil and moisture. Compressed air is cleaned by both *mechanical separation* and *filtration/absorption.* Air entering filter inlet (1) strikes Deflector Cup (2) by which heavier droplets of water and dirt particles are directed to sides of Housing (3) and thence downward at high velocity to base where liquid and heavier particles are deposited. The *mechanically cleaned* air then passes at low velocity thru the Discs (4) which *filter* the air and *absorb* the last traces of oil and moisture. Clean, dry air passes out thru fine mesh Bronze Screen (5) and Outlet (6). Swing Bolts (7) on head for easy inspection are optional.

Originally designed for the protection of pneumatically operated control apparatus, these revolutionary filters are now used as a primary or final stage of filtration for an ever-increasing number of tools, devices and processes. Many highly successful installations are reported in which no other filter had proven satisfactory.

Request Bulletin B-1A, mentioning problem involved for specific engineering information. Please direct your inquiry to Dept. 7.

Staynew

ABSORPTION FILTER

A complete range of sizes available, handling capacities from 5 to 100 CFM free air at 80 lbs. gauge pressure in standard pipe sizes from ¼" to 2". Model illustrated is AAPHS (swing-bolt head). Available also is Model AAPH, identical except for bolted-head construction.

DOLLINGER
REG.
PROTECTOMOTOR
U.S. PAT. OFF.
STAYNEW FILTERS

DOLLINGER CORPORATION
11 CENTRE PK., ROCHESTER 3, N. Y.

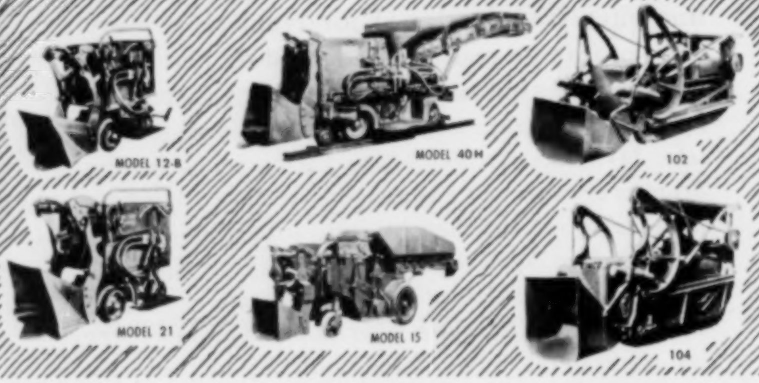
In Canada: Toronto - McCarthy and Robinson   Montreal - Engineering Equipment Co.   In France: Paris - Société Tecalemit

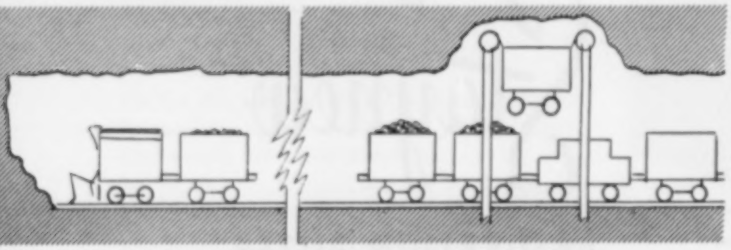
CASE HISTORY OF A SUCCESSFUL TUNNEL JOB

FROM THE EIMCO FILE T101

LEADVILLE DRAINAGE TUNNEL

Proposed tunnel length, 17,300; Length completed at end of war, 6,600; Tunnel size, 9' x 10'6"; Supported section, 64% of length; Rock section, 36% of length.





"Cherry Picker" method of car switching was used in the Leadville Tunnel. The frame was erected to lift the empty above the train of loads moving out, then lowered to be moved to the face for loading.

Equipment used for rock loading on contract jobs must be well built, proved, heavy-duty equipment—capable of standing up to the most difficult—most unexpected operating conditions.

Tunnels are carefully surveyed before they are started. Test holes are drilled from the surface at selected spots along the tunnel line to determine the ground structure through which the tunnel is to be driven, but even then, as in the Leadville Drainage tunnel, there are unseen glacial channels and faults which make progress slow and dangerous.

Loading in the Leadville Tunnel was done with Eimco Model 21 RockerShovels. These machines were subjected to the most severe operating conditions working in water at 37° temperature with an average flow of 3000 to 7000 gallons per minute.

EIMCO

THE EIMCO CORPORATION

The World's Largest Manufacturers of Underground Rock Loading Machines
EXECUTIVE OFFICES AND FACTORIES — SALT LAKE CITY 10, UTAH, U. S. A.

BRANCH SALES AND SERVICE OFFICES:
NEW YORK, 51-52 SOUTH STREET • CHICAGO, 3319 SOUTH WALLACE STREET
BIRMINGHAM, ALA., 3140 FAYETTE AVE. • DULUTH, MINN., 216 E. SUPERIOR ST.
EL PASO, TEXAS, MILLS BUILDING • BERKELEY, CALIFORNIA, P. O. BOX 240
KELLOGG, IDAHO, 307 DIVISION STREET

IN FRANCE: SOCIETE EIMCO, PARIS, FRANCE
IN ENGLAND: EIMCO (GREAT BRITAIN) LTD., LEEDS 12, ENGLAND
AGENTS IN ALL PRINCIPAL CITIES THROUGHOUT THE WORLD

You can't beat an Eimco!

$10,000 SAVED
in one year
with ROTARY AIR
IR IMPACTOOLS
Size 504 Impactool
Capacity ⅝'' Bolt Size
Size 500B Impactool
Capacity 5/16'' Bolt Size
Size 534 Impactool
Capacity 1-⅛'' Bolt Size
Size 588 Impactool
Capacity 4'' Bolt Size
Size 538 Impactool
Capacity 1-½'' Bolt Size

Shown here are
representative
sizes from the
complete line of
I-R
Air Impactools
designed to meet
all nut-running
requirements.

A mid-western manufacturer of materials handling equipment saved $10,000 in one year by installing Ingersoll-Rand Air Impactools on an idler assembly nut running job in his plant. The installation of the Impactools and accessory equipment cost $1200, which quickly paid for itself in 33 days!

Similar time and labor savings can be made in your plant, on your jobs. Air Impactools are available in thirteen sizes to handle nut running jobs up to 4″ bolt size. The smallest Impactool, for work up to 7/32″ bolt size, weighs only 1⅜ pounds; the twelve larger sizes are correspondingly packed with top power per pound.

You get no tiring and wasteful kick or twist with an Impactool . . . full power is delivered to the work . . . quickly running up or removing nuts and screws. Ingersoll-Rand, *originator of Impactools,* has manufactured these sturdy and reliable machines for 18 years. Today they are in use in thousands of plants around the world, saving countless dollars and hours. Call, write, or wire your Ingersoll-Rand branch office—an Air Power Specialist will be glad to give you complete details, or arrange an eye-opening, dollar-saving trial or demonstration in *your* plant.

AIR POWER
The Key to Lower Production Costs

Ingersoll-Rand 11 BROADWAY, NEW YORK 4, N. Y.

661-8

COMPRESSORS • AIR TOOLS • ROCK DRILLS • TURBO-BLOWERS • CONDENSERS • CENTRIFUGAL PUMPS • DIESEL & GAS ENGINES

YOU CAN BE **SURE**.. IF IT'S
Westinghouse

NEW Large Induction Motors Cut Maintenance Costs 2 Ways

Ease of inspection . . . low-cost maintenance stand out in industry's new large motor—the Westinghouse ***Type CSF.***

Heading the list of cost-cutting features are sectional construction of end covers and air shields. Gone is the need for overhead cranes and costly, time-consuming operations. There's no top half of the bracket to remove . . . only the top half of the bearing housing.

Sectional covers can be removed from both ends of the motor in a few minutes for complete inspection, cleaning and other servicing requirements. The rotor and brackets need not be disturbed

Split-sleeve bearings and oil rings make inspection or replacement easy. Simply remove the bearing housing cap. Bearings can be removed and replaced, by hand, without disturbing the bracket mounting.

Permanently aligned bearings assure proper air gap. The bottom half of the bearing housing is integral with the bracket, which is accurately machined and held in perfect alignment by a rabbet fit on the stator.

Added to these outstanding advantages are many other features that tell you these motors are built to do your job best . . . at lower cost. Get the facts from your Westinghouse representative, or write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa.

J-21551

Westinghouse

LARGE INDUCTION MOTORS

WESTINGHOUSE

1. Quick Inspection and Servicing!
2. Easy Bearing Accessibility!

Westinghouse **Type CSF** *Motors are available, squirrel-cage or* **Type CWF** *wound rotor, in four types: drip-proof, outdoor, splashproof and totally-enclosed, fan-cooled—in frame sizes 30 and larger, 4 or more poles.*

Adding New Facilities To America's Industrial Might!

Middle bay of new Kenosha copper tube mill showing 100-foot, triple-die draw benches and annealing furnace.

Faster production, higher precision, greater efficiency! These are the answer of American industry to the enemies of world freedom. Typical of the achievements that help the nation's industrial mobilization is the current mill improvement program of The American Brass Company.

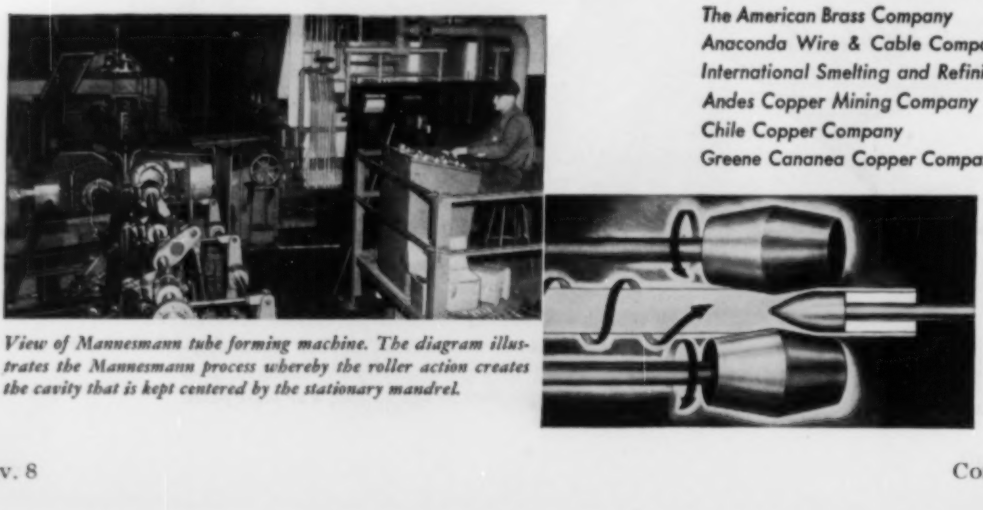
A recently completed phase of that program is the new copper tube mill at the Kenosha, Wisconsin, Branch. This plant produces large quantities of highly essential copper tubing—and produces it more efficiently than ever before. An important feature of the mill is the high-capacity Mannesmann tube-forming machine used to convert cylindrical billets into heavy-walled seamless copper tubes. The Midwestern location of the Kenosha mill speeds delivery to industrial plants across the nation.

Right now the country's defense needs have first call on Anaconda Copper, Brass and Bronze. But finer things for a world at peace are sure to result from our plant improvement program. These mighty metals serve your freedom today—your comfort and convenience tomorrow. 51322A

ANACONDA®

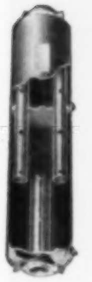
First in Copper, Brass and Bronze

The American Brass Company
Anaconda Wire & Cable Company
International Smelting and Refining Company
Andes Copper Mining Company
Chile Copper Company
Greene Cananea Copper Company



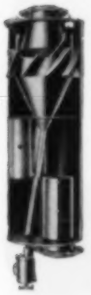
View of Mannesmann tube forming machine. The diagram illustrates the Mannesmann process whereby the roller action creates the cavity that is kept centered by the stationary mandrel.

MAXIM MAKES THE MOST COMPLETE LINE OF SILENCING EQUIPMENT AVAILABLE



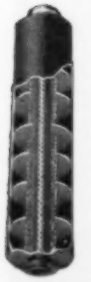
EXHAUST AND INTAKE SILENCERS

. . . designed to silence the exhaust or intake of internal combustion engines, steam engine exhaust, air compressor intake, vacuum pump discharge and the intake or discharge of blowers.



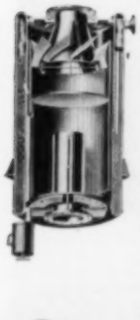
SPARK ARRESTOR SILENCERS

. . . provide effective silencing of exhaust noise plus 100% spark arresting — for use where fire safety is imperative or where dirt nuisance must be eliminated.



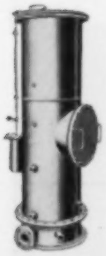
STEAM BLOW-OFF SILENCERS

. . . developed to reduce to a minimum the discharge roar of high velocity steam, air or gas to atmosphere. They are used in installations involving steam safety valve discharges, etc.



HEAT RECOVERY SILENCERS

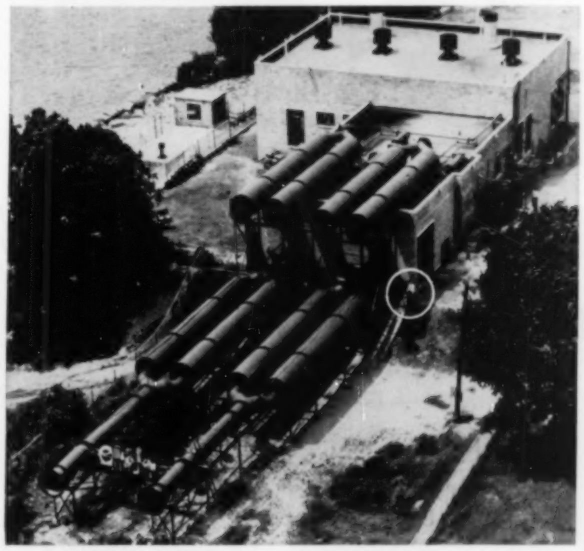
. . . combining efficient silencing of engine exhaust noise with spark arresting (where necessary) and with the efficient recovery of waste exhaust heat to produce steam or hot water for heating or processing operations.



EVAPORATOR DISTILLERS

. . . produce fresh water to a purity of 3½ parts per million from sea water — capacity smallest unit 350 gals. per day. ALL MONEL, high circulation rate means minimum scaling.

The pioneer in the development and manufacture of silencing equipment, Maxim today offers industry the most complete line of silencing equipment available. Longer experience in the silencing field, coupled with progressive research and engineering, have made Maxims the best answer to superior silencing for standard as well as special jobs. Maxim makes motorboat silencers that you can hold in your hand and silencers, for testing jet engines, that fill an entire flat car. There's a good deal in the saying that, "Maxim can silence anything that comes out of a pipe."



These big Maxim Silencers (note size of man in circle) quiet the scream of centrifugal compressors on test stands . . . a tough silencing job that Maxims are handling with quiet efficiency.

Consult **MAXIM**

THE MAXIM SILENCER COMPANY **61 HOMESTEAD AVE., HARTFORD 1, CONNECTICUT**

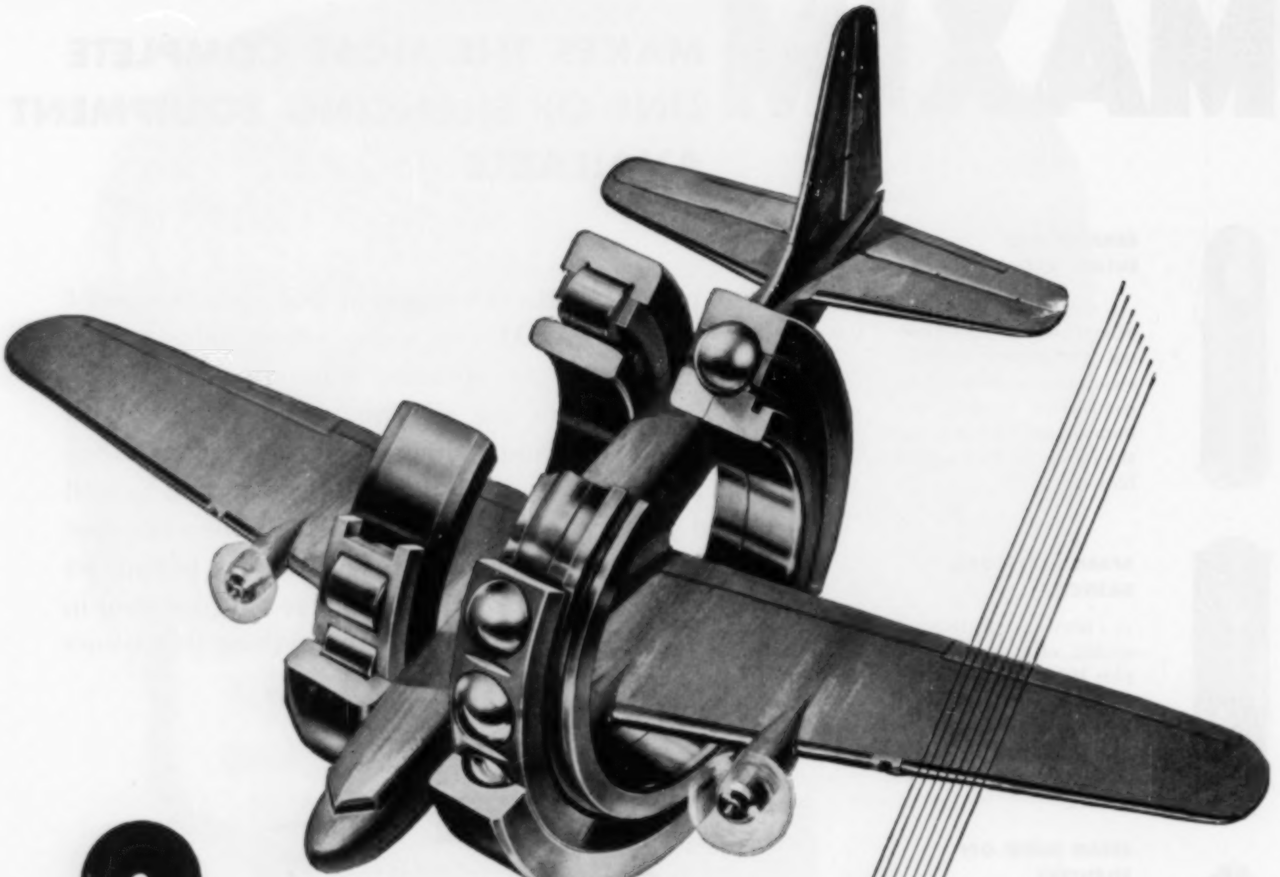
Gentlemen: Please send me information on:

☐ Exhaust and Intake Silencers
☐ Spark Arrestor Silencers
☐ Steam Blow-off Silencers
☐ Heat Recovery Silencers
☐ Evaporator Distillers

Name ______________________

Company ______________________

Address ______________________



9/10

The engine manufacturers who produce approximately nine-tenths* of the power for AMERICA'S aircraft use SKF BEARINGS.

This, again, is typical of the acceptance of **SKF** Bearings by *all* industry—acceptance which has been built on confidence in **SKF**'s ability to help industry put the right bearing in the right place. 7165

8 REASONS
WHY SKF
IS PREFERRED
BY ALL INDUSTRY

- integrity
- craftsmanship
- metallurgy
- tolerance control
- surface finish
- product uniformity
- engineering service
- field service

SKF
BALL AND ROLLER BEARINGS

SKF INDUSTRIES, INC., PHILADELPHIA 32, PENNA.
-manufacturers of **SKF** *and* HESS-BRIGHT *Bearings.*

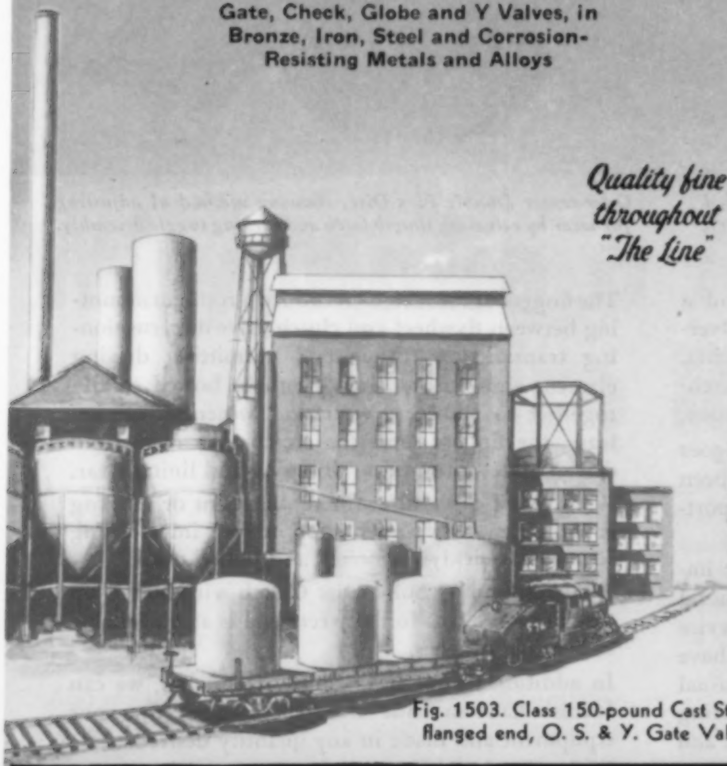
WHAT ABOUT *Wishful Thinking?*

Merely hoping a certain valve will do a required job is not enough. Maybe it will—at first. But if it's not the *right* valve in every particular—design, construction and materials—"it won't be long!"

There's a Powell Valve specially adapted to each and every flow control service. Why not always be sure with Powell?

Gate, Check, Globe and Y Valves, in Bronze, Iron, Steel and Corrosion-Resisting Metals and Alloys

Quality fine throughout "The Line"



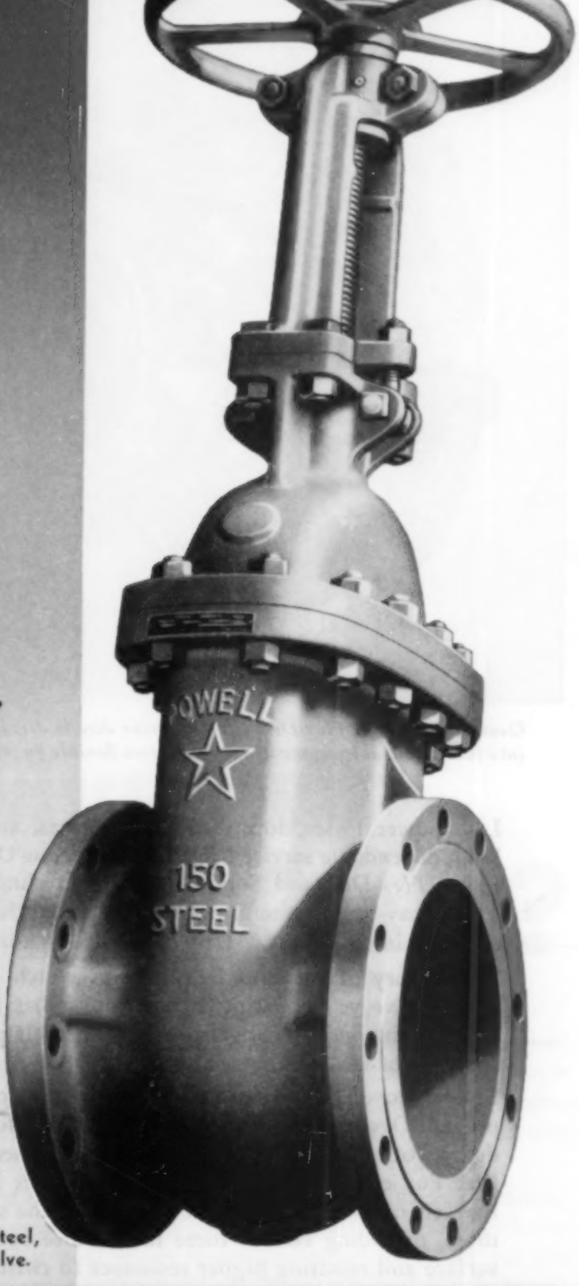
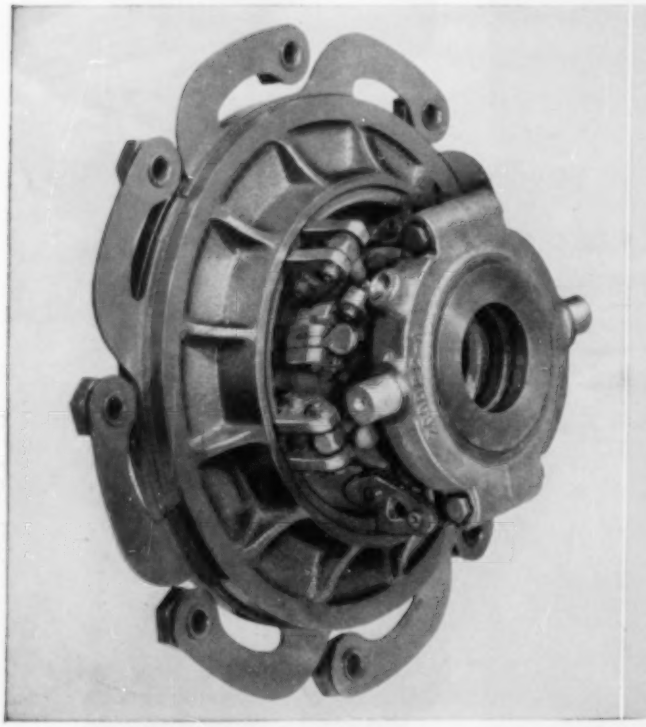


Fig. 1503. Class 150-pound Cast Steel, flanged end, O. S. & Y. Gate Valve.

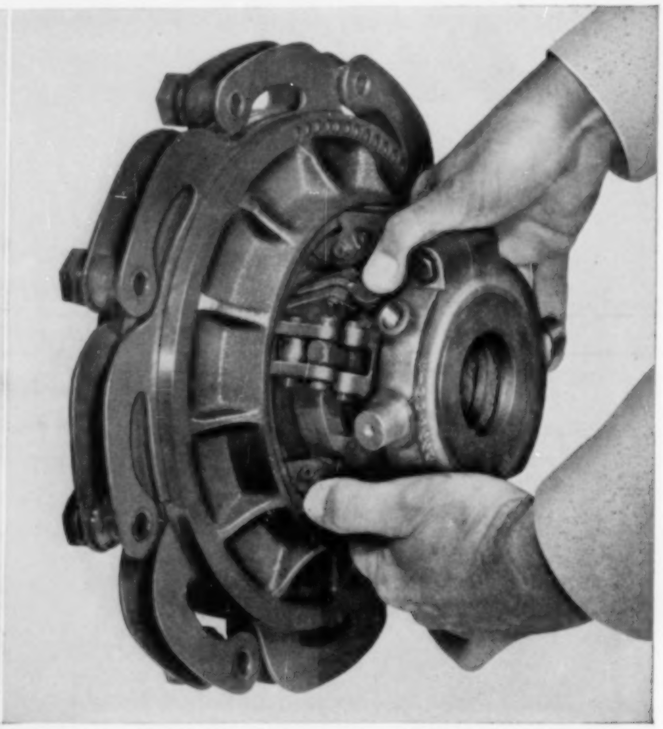
POWELL

The WM. POWELL CO., 2525 Spring Grove Ave., P. O. Box 106, Station B, Cincinnati 22, Ohio

A High Quality Industrial Clutch
The Over-Center *Flex-Disc*



Over-center Single Flex-Disc Clutch. Drive disc is divided into four removable segments each with two flexible fingers.



Over-center Double Flex-Disc, showing method of adjusting for wear by releasing thumb latch and turning toggle assembly.

Low power losses, low maintenance costs, and a long, dependable service life characterize our Over-center *Flex-Disc* and Solid Disc friction clutches. These heavy duty, general purpose industrial clutches range in size from 275 to 19060 lbs.-ft. torque.

The history of the *Flex-Disc* type of clutch goes back twelve years, during which time it has been used continuously by Ingersoll-Rand in their portable line of air compressors.

Several novel design features have given our improved Over-center *Flex-Disc* Clutch an unusual degree of adaptability, performance, and service life. For example: — all of these clutches have five sets of over-center toggles instead of the usual three, providing two or three times more bearing surface and resulting higher resistance to twist and wear. The carrying of the center and push plates on the hub plate by hardened pins is a more durable construction than hitherto used.

The fingers of the *Flex-Discs* afford a resilient mounting between flywheel and clutch drive disc, cushioning transmission torque and permitting driving element and clutch drive disc to be bolted solidly together to eliminate wear and looseness. On release, the fingers force the clutch disc away from driven plates, preventing dragging and lining wear.

Removal of drive discs for replacement or relining is made easy by a construction of four interlocking segments, quickly unhooked and pulled out.

A corresponding Solid Disc Clutch with bolted up disc in two halves for easy removal is also available in a range of sizes.

In addition to our listed lines of clutches, we can furnish Custom-made clutches designed for your equipment and made in any quantity desired.

Write for bulletin 5003 for further information and specifications on Over-center clutches.

*U. S. Patent Nos. 2,177,362; 2,259,461; 2,303,201 and others pending.

INDUSTRIAL CLUTCH CORPORATION

Waukesha Wisconsin

Why Make a Mystery of Wire Rope Costs?

Every once in a while we run across somebody who's hopelessly confused about his wire rope costs. Sure, his books show him the total he spends each year—so much for this brand, so much for that brand, so much for a third. But he never really knows what he's getting from each brand in terms of work.

And work is what he buys with every cent he spends on rope. Work determines the cost—the *actual* cost.

He could easily clear things up by recording what each rope does . . . in terms of ton-miles, cubic yards of rock moved, or other simple, appropriate units. That would give him a basis for actual comparisons of costs and actual comparisons of brands.

Bethlehem has long recommended such a system, and more and more customers are using it. They have found it well worth the minor effort involved, for it's done away with guessing. They've found, too, in keeping such records, that every dollar spent on Bethlehem rope buys a mighty big dollar's worth of service.

LET YOUR RECORDS TELL YOU!

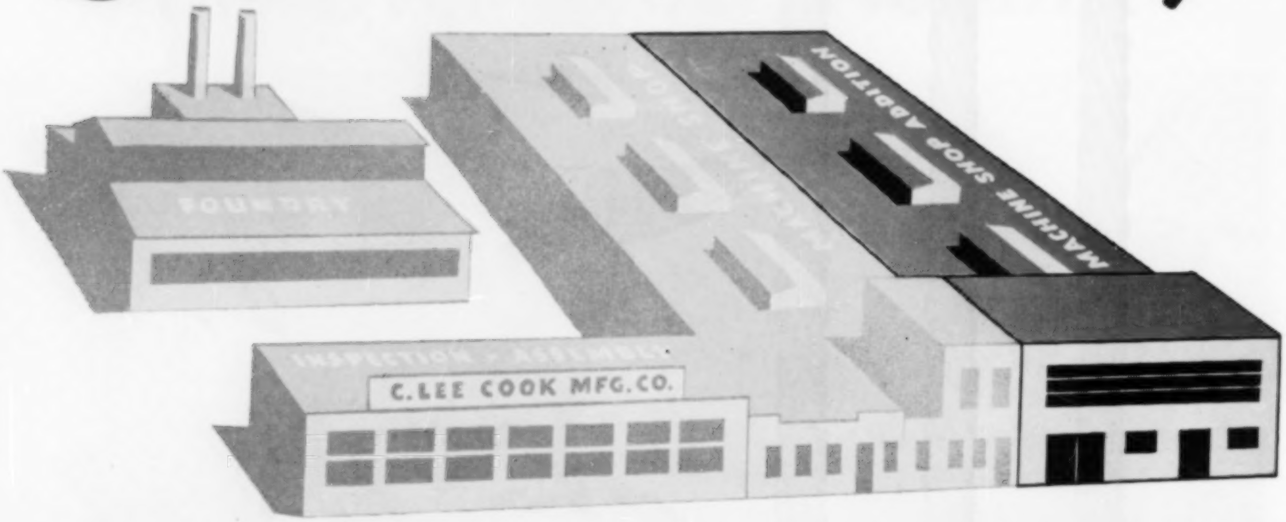
BETHLEHEM
WIRE ROPE

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by
Bethlehem Pacific Coast Steel Corporation
***Export Distributor:* Bethlehem Steel Export Corporation**

BETHLEHEM STEEL

But — WAIT!



We're stepping up production of Cook Piston Rings and Packings... a big 50%

We're not ashamed to admit it — we've been having a difficult time keeping up with the tremendously increased demand for Cook piston rings and packings.

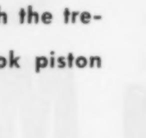
Our production lines have long been working at top capacity to maintain satisfactory delivery schedules. But, when you're turning out precision-made products you just don't cut corners. Cook packings and piston rings have an established reputation for superior performance, and we are unwilling to deviate from the rigid engineering and manufacturing standards that have made this possible. Our customers' confidence in our products is one of our most valued assets.

Yes, maintaining these standards and keeping up with orders has been a big problem. Now, at last, we're able to do something about it. We're adding a new modern machine shop to our present plant. The new addition will boost present capacity a whopping 50%.

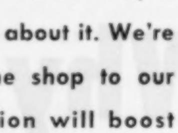
Sure, we're doing everything possible to give you as prompt service as possible now — BUT, WAIT until our new plant goes into operation — we're *growing* to give you even better service.

C. Lee Cook Mfg. Co., Incorporated, Louisville, Ky. Branch offices in Baltimore, Boston, Chicago, Cleveland, Houston, Los Angeles, Mobile, New Orleans, New York, San Francisco and Tulsa.

COOK GRAPHITIC IRON
ROD PACKINGS



COOK GRAPHITIC IRON
PISTON RINGS



. . . SEALING PRESSURES SINCE 1888 . . .

LONG LASTING

Condor V-BELTS

"We don't have to buy belts so often since we started using Condor Whipcord V-Belts," say users, "and we save on maintenance, need less inventory, and with all, get better power transmission!"

Long life is built right into every Condor V-Belt. Therefore, these belts have less stretch on your drive, don't require take-up so often. And the engineered straight sidewalls grip pulleys snugly and deliver positive power. All the advantages are described in Bulletin 6868 D, mailed on request. You'll find our hose, flat belting and conveyor belts last longer, too. Phone your R/M Distributor.

R/M

MANHATTAN RUBBER DIVISION—PASSAIC, NEW JERSEY

RAYBESTOS-MANHATTAN, INC.

Manufacturers of Mechanical Rubber Products • Rubber Covered Equipment • Radiator Hose • Fan Belts • Brake Linings • Brake Blocks • Clutch Facings • Packings • Asbestos Textiles • Powdered Metal Products • Abrasive & Diamond Wheels • Bowling Balls

Know your valves
Do's and don't's for better piping service
Variations in stem operation of gate, globe, and angle valves
Each type has its own features
The different types of bonnet joints on gate, globe, and angle valves
Which meets your needs best?
PIPING POINTERS
Helpful hints on the application and maintenance of piping equipment
Including the CRANE valve selection guide

Just Out!

NEW 36-PAGE EDITION OF

PIPING POINTERS

...a bigger, more helpful handbook for training maintenance workers

You asked for ¼ million copies of the last edition of Piping Pointers. You found it a big help in training beginners and refreshing veterans in your piping crews. The bigger and better edition is just out—changed in appearance but not in purpose. Crane again offers this booklet—to help keep your piping systems at peak efficiency.

Piping Pointers talks facts . . . not theory. Thoroughly covers the fundamentals of good, sound, everyday piping practices . . . in easy-to-grasp, nontechnical language. Its many "how-to-do-it" features are illustrated for easy understanding.

Mistakes in piping installation and maintenance cost more today. Piping Pointers can help your men avoid them. Just ask your Crane Representative for a copy.

PARTIAL INDEX TO PIPING POINTERS

HOW TO choose valves for every service . . . install valves . . . read reducing fittings . . . make up screwed joints . . . assemble flanged joints . . . make up solder joints . . . install pressure regulators . . . use vent and drain valves . . . avoid steam trap trouble . . . save on pipe joints and materials . . . handle piping tools.

plus THE CRANE VALVE SELECTION GUIDE

which saves time and effort in selecting valves for common piping services.

PIPING POINTERS 16-mm SOUND FILM

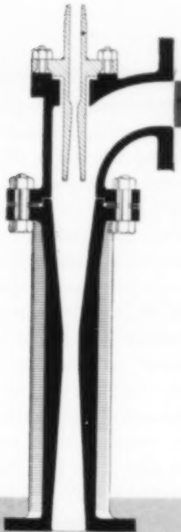
Free Usage for Group Training

A 30-minute motion picture that dramatizes the fundamental information in the Piping Pointers Manual. Ideal for classroom or plant training groups. Available on request through your local Crane Branch.

CRANE

CRANE CO., *General Offices:*
836 S. Michigan Ave., Chicago 5, Ill.
Branches and Wholesalers Serving All Industrial Areas

VALVES • FITTINGS • PIPE • PLUMBING • HEATING



for suction pressures down to .002″ (50 microns)

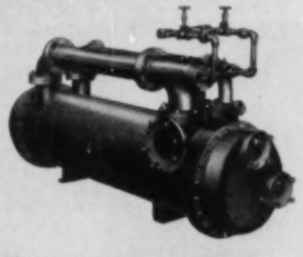
YOU CAN SAVE

operating and upkeep costs

WITH I-R STEAM-JET EJECTORS

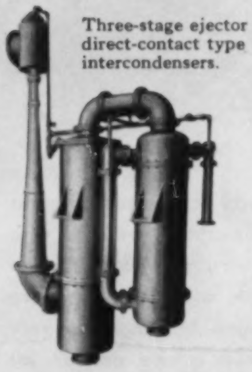
Single-stage ejector with direct-contact type aftercondenser.

Two-stage, single-element ejector with direct-contact type intercondenser.

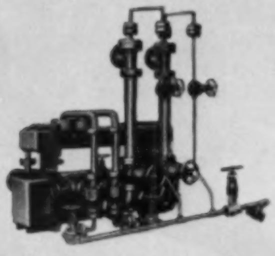


Single-stage, twin-element ejector mounted on surface-type precooler and aftercondenser.

Large booster-type ejector, similar to smaller sizes except with multiple one-piece steam nozzles and welded construction.



Three-stage ejector with direct-contact type intercondensers.



Two-stage, twin-element ejector with surface-type intercondenser and aftercondenser.

Two-stage, single-element, non-condensing ejector.

Whatever the capacity—whatever the gases or vapors to be handled—Ingersoll-Rand steam-jet ejectors can generally do the job far more economically than any other type of equipment. Their utter simplicity of design and operation assures long life and sustained high efficiency, with practically no maintenance at all.

Suction pressure is obtained by a steam-jet discharging into a specially formed suction chamber and venturi-shaped diffuser. That's all there is to it. There are no moving parts to wear out—no excessive noise—no vibration. Ejectors can be installed anywhere, with little or no foundation, and can be operated by inexperienced personnel.

Single-stage, two-stage and multi-stage ejectors can be supplied in any required combination—with pre-coolers, intercondensers and aftercondensers to meet the specialized needs of practically any application for suction pressures down to 50 microns (.002″ Hg absolute).

Ingersoll-Rand's unequalled experience in vacuum equipment—both steam-jet ejectors and reciprocating pumps—is your assurance of impartial service in meeting your low-pressure requirements. For further information, contact your nearest I-R representative, or write for a free copy of Bulletin 9013A.

IR

Ingersoll-Rand

11 Broadway, New York 4, N. Y. 682-4

COMPRESSORS • AIR TOOLS • ROCK DRILLS
TURBO-BLOWERS • CONDENSERS • CENTRIFUGAL PUMPS
DIESEL & GAS ENGINES

Longer Nozzle Life *Every* Time

IF YOU are looking for a way to increase nozzle life in your blast cleaning department—if you wish to do away with costly time-wasting while worn-out nozzles are replaced with new nozzles—if you are searching for means to improve blasting efficiency and increase production—there is one answer for all three problems: NORBIDE Nozzles. Made of Norton Boron Carbide—the hardest man-made material—NORBIDE Nozzles will outwear conventional types fifty to one. This same wear-resistance enables these nozzles to retain peak efficiency for a long period with resultant production increases. Air consumption is reduced 10 to 20%. Stream contour and abrasive velocity are maintained.

For information as to size and price write for Bulletin No. 543

NORTON COMPANY
Worcester 6, Massachusetts

NORTON NORBIDE PRODUCTS

ON THE COVER

THE machine pictured was developed for a toy manufacturer to paint three colors on both sides of a plastic duck at the rate of 1200 pieces per hour. At each station are masks to shield the parts not to be coated and the operators move the pieces, which are painted in halves, from one color mask to the next one. Painting is done from underneath at the far side of the table while the vertical pistons shown hold the pieces firmly in the masks. The man at the right removes the two halves after three colors have been applied. The table indexes eight times per revolution and is at rest while paint is being applied. Table movements are powered by compressed air and the paint is sprayed by air with fourteen DeVilbiss guns. The table was designed and manufactured by Conforming Matrix Corporation, Toledo, Ohio.

●

IN THIS ISSUE

IN THIS age of chrome and stainless steel, the brownstone structures of our eastern cities seem drab indeed. This was not always so, however, and our leading article attempts to turn the calendar back to the time when brownstone was all the rage.

●

THE nation's smallest automobile assembly plant, near Portland, Oreg., turns out 25 cars a day. It relies largely on air power, both for moving subassemblies and for operating tools of various kinds. Page 206.

●

PLASTIC coatings are coming into extensive use for protecting metal surfaces against corrosion. They are effectively sprayed, in the thicknesses desired, with an air-operated gun that operates on the principle of metallizing apparatus. Page 209.

●

TRUCK beds and loading platforms are of many heights, but they can be made to meet exactly by the ingenious use of cylinders powered by compressed air. Page 212.

●

THROUGH the courtesy of *The Reader's Digest*, we reprint a fascinating description of tiny tools of scientists that are controlled with compressed air. Page 217.

●

CORRECTION

THE quarry at Bridgeport, Ala., mentioned under the heading: "Old Drill Holes," on page 191 of our July issue is not operated by the Tennessee Valley Authority as stated, but by a contractor who is supplying stone from it to the TVA.

Compressed Air Magazine

COPYRIGHT 1951 BY COMPRESSED AIR MAGAZINE COMPANY

VOLUME 56 **August, 1951** NUMBER 8

G. W. MORRISON, *Publisher*
C. H. VIVIAN, *Editor* J. W. YOUNG, *Director of Advertising*
ANNA M. HOFFMANN, *Associate Editor* J. J. KATARBA, *Business Mgr.*
A. W. LOOMIS, *Assistant Editor* JOSEPH C. DILTS, *Advertising Mgr.*
D. Y. MARSHALL, *Europe*, 243 Upper Thames St., London, E. C. 4.
F. A. MCLEAN, *Canada*, New Birks Building, Montreal, Quebec.

EDITORIAL CONTENTS

The Brownstone Era—*C.H. Vivian* 198
First Small Auto Assembly Plant—*J.A. Newton* 206
Press Bales Carload of Scrap per Shift 208
Flame Spraying Plastics—*John Starr* 209
Tilting Ramps Put Trucks and Platforms on the Level 212
Suction Turns Socks in Hosiery Mill 214
Navy Divers Work at 10,000 Feet Altitude 215
Atomic Standard of Length Available to Laboratories 216
Science's Invisible Tools 217
Worked-out Mine Serves as Storage Place for Oil 218
Editorials—A Vanished Fashion—Good Business 219
This and That 220
Industrial Notes 221
Books and Industrial Literature 226

ADVERTISING CONTENTS

Adams Co., Inc., R.P. 29
Allis-Chalmers Mfg. Co. 34
American Air Filter Co., Inc. 24
American Brass Company 8
Armstrong Machine Works 33
Bethlehem Steel Company 13
Bucyrus-Erie Company 31
Cook Mfg. Co., Inc., C. Lee 14
Crane Company 16
Crucible Steel Co. of America 37
Dollinger Corporation 3
Donaldson Co., Inc. 33
Eimco Corporation, The 4
General Electric Company 25, 26
Goodall Rubber Company 36
Industrial Clutch Corporation 12
Ingersoll-Rand Company ..... 5, 17, 28, 3rd Cover
Madison-Kipp Corporation 35
Manhattan Rubber Division 15
Maxim Silencer Co., The 9
National Forge & Ordnance Co. 30
Naylor Pipe Company 22
New Jersey Meter Company 33
Nicholson & Co., W.H. 36
Norton Company 18
Powell Co., The Wm. 11
Raybestos-Manhattan, Inc. 15
Sarco Company, Inc. 36
Sauerman Bros., Inc. 36
SKF Industries, Inc. 10
Texas Company, The ..... 2nd Cover
Timken Roller Bearing Co., The ..... Back Cover
Victaulic Co. of America 19
Vogt Machine Company, Henry 27
Waldron Corporation, John 23
Walworth Company 20, 32
Waukesha Motor Company 21
Westinghouse Electric Corp. 6,7

A monthly publication devoted to the many fields of endeavor in which compressed air serves useful purposes. Founded in 1896.

CCA Member Controlled Circulation Audit

Published by Compressed Air Magazine Co., G. W. MORRISON, *President;*
C. H. VIVIAN, *Vice-President;* J. W. YOUNG, *Secretary-Treasurer.*
Editorial, advertising, and publication offices, Phillipsburg, N. J.
New York City Office, 11 Broadway. L. H. GEYER, *Representative.*
Annual subscription: U.S., $3.00; foreign, $3.50. Single copies, 35 cents.
COMPRESSED AIR MAGAZINE is on file in many libraries and is indexed in Industrial Arts Index and in Engineering Index.

The Brownstone Era

It Supported Hundreds of Quarries, Some of Which Became Outstanding

C. H. Vivian

INACTIVE PORTLAND QUARRIES

Water fills most of the cavernous openings in Connecticut from which millions of tons of stone were extracted and shipped to all parts of the country. Dimly visible in the background of the view at the top is the bridge across the Connecticut River at Middletown.

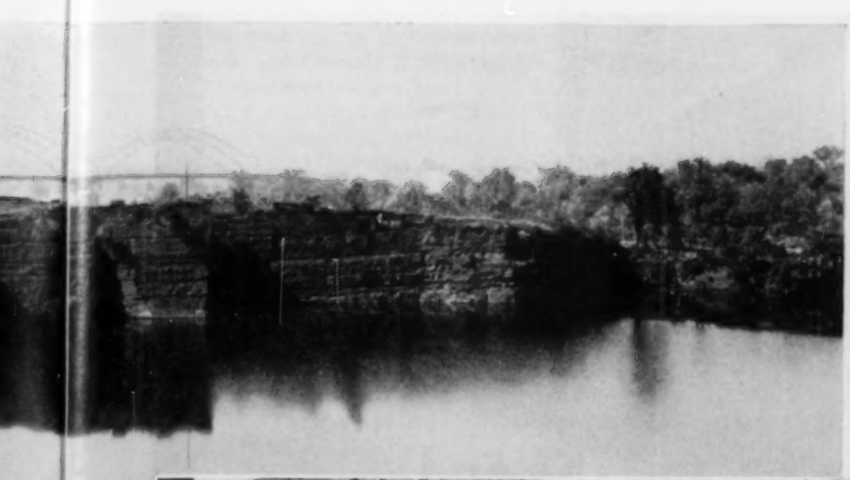
BEGINNING around 100 years ago and continuing for a good half century and longer, brownstone houses were the height of urban fashion. Every family in the cities along the eastern seaboard aspired to own one, and many of them eventually did. To reside in a home with a brownstone front was to be somebody worth while. Thus brownstone came to be a symbol of affluence and elegance. That was especially true in New York City, and only slightly less so in Philadelphia, Baltimore and Washington, the principal difference being that more people in New York than elsewhere had enough money to indulge this passion. From the large cities the penchant for brownstone spread to the lesser communities and even into the countryside, although there the people were more concerned with building for utility than with making a good impression on their neighbors.

Over the course of five or six decades, long, solid rows of brownstone structures were erected in New York, and hundreds of them remain today as architectural reminders of an era that knew nothing about movies, television, automobiles, airplanes, and numerous other modern mechanical marvels and divertisements. Life moved slower then, and a carriage was considered fast and luxurious transportation. The houses in these almost endless rows are as alike outwardly as peas in a pod, but the monotony that is instantly evident in them now probably wasn't any more offending in the past than a line of similar-looking automobiles is to us today. In any event, the urge to possess one continued unabated for a long time.

In interior arrangement, also, the brownstones followed a more or less standard pattern. The basement floor was a few feet below street level and reached by descending a few steps. It had a dining room in front and a large kitchen in the rear that usually opened out into a small yard. The main entrance was approached by a flight of stairs leading from the street to the first floor with its front and back parlors. On the upper floors, of which there were generally not less than two, were the bedrooms and at least one bathroom.

In the typical city house, the brownstone front was only a thin veneer placed usually over brick. Brownstone was invariably used for the foundations and the steps with side railings whose round and often fancy balusters were even turned from that material. The more opulent citizens who could afford space for a larger yard built mansions oftentimes entirely of brownstone and not infrequently with rather ornate trimming. It was likewise popular for churches and other public edifices and was often favored in whole or in part for business structures.

Just how this liking for such a somber color reached craze proportions is hard to explain. Certainly an almost unbroken block-long expanse of dull, brown fronts is hardly attractive, especially after the



BIRTHPLACE OF THEODORE ROOSEVELT

The house at 28 East Twentieth Street, New York City, where the former president was born on October 27, 1858. It was reconstructed by the Women's Theodore Roosevelt Memorial Association in 1921-23. The brownstone for the front came from a Connecticut quarry, probably at Portland.

EWING GALLOWAY PHOTO

EWING GALLOWAY PHOTO

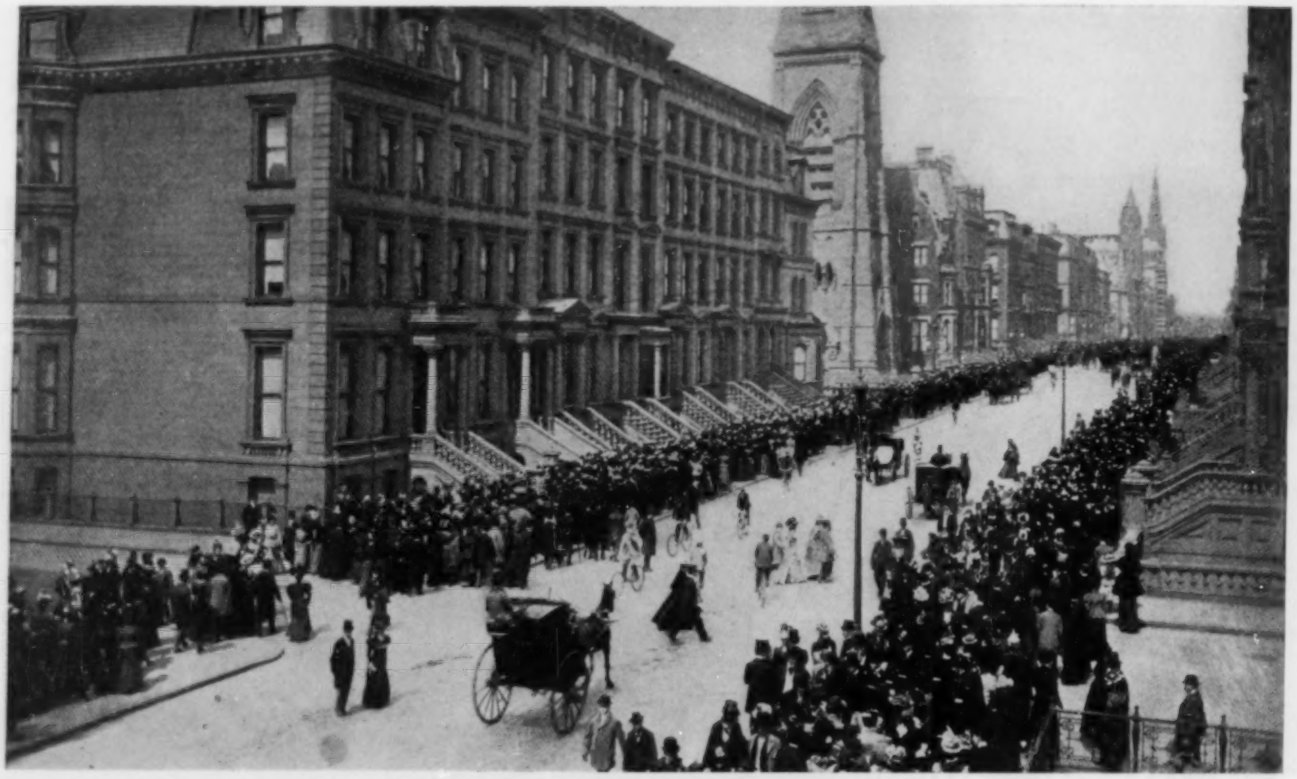
TRINITY CHURCH, NEW YORK

This brownstone structure amid tall buildings in the financial district has been standing 105 years and is the third house of worship to occupy the site. The stone came from Little Falls, N.J. Many of the gravestones in the churchyard also are of brownstone.

inevitable city grime has hidden what little life and sparkle the original material may have had. Even the people of that era came in time to recognize this lackluster, and there was a tendency to relieve the drabness by using stone of two tones, albeit both were brown. Be that as it may, the popularity of brownstone is attested to by figures in the 1880 census showing that it entered into 78.6 percent of the 19,000-odd buildings in New York embodying stone. As the splurge continued for a good 20 or 25 years after that, the total number of brownstone structures must have been very large indeed.

To minister to this architectural orgy, millions of tons of brown-hued rock was wrested from sedimentary formations far and wide. Some came from England and Scotland, but most of it was extracted from beds of the Triassic age that outcrop from Massachusetts to North Carolina. Probably several hundred quarries in this belt were worked in all, although most of them supplied just local needs and operated only when there was a demand for the stone. A few, however, grew large and prosperous and were active for many years. Unquestionably, foremost among them were the Portland, Conn., quarries, and there was a long period when brownstone and Portland stone were synonymous terms. Probably next in importance were those at Hummelstown, Pa., and Belleville, N.J. Another major producing district was East Longmeadow, Mass., while dozens of others flourished at one time or another. As the fad spread farther west, quarries were opened in Indiana, Michigan, Minnesota, Ohio, and Wisconsin. They supplied most of the needs of those areas and also made occasional shipments to the East.

Actually, the demand for the stone was so great at times that the established sources of supply could not meet it and



BETTMANN ARCHIVE PRINT

NEW YORK BROWNSTONES

A view, undated, looking northward on Fifth Avenue from Forty-seventh Street on an Easter morning. Visible on both sides of the street are rows of typical brownstone-front houses with their first floors partially underground and with ornate stone steps, locally called stoops, leading up to the main entrances.

other quarries found a ready market for their product. Some of this material was of inferior quality, did not stand up, and consequently gave brownstone somewhat of a black eye but hardly black enough perceptibly to quiet the public clamor for it. There were other factors that threatened to challenge the stone's popularity, but in the end they, too, did little to overthrow the people's choice.

Of first importance among these was the bad practice of standing the thin slabs "on edge," or at right angles to their natural plane. The beds were laid down on the ocean floor in a horizontal position and became laminated in that plane. Quarried stone placed with the laminae naturally disposed always gave satisfactory service, and it was usually laid that way when used to build full wall sections. However, the thin slabs with which the facades were veneered were invariably split along the plane of lamination because that was the easiest way to work the material. When they were stood on edge, water penetrated the highly absorptive stone and, during freezing weather, formed ice that tended to disrupt the slab. Much of the flaking that occurred after only a few years was attributable to this faulty placement, and it is readily noticeable today on walls, stair balusters, and other parts of hundreds of New York's old brownstone fronts.

Much of the brownstone deteriorated quickly because it was used too soon after being quarried. All stone in place contains moisture—quarrymen call it sap, and porous sandstone has a relatively high content. Freshly cut stone is comparatively soft and easy to work but should be seasoned or allowed to dry before use. When Sir Christopher Wren was planning St. Paul's Cathedral in England he specified that all stone entering into its construction should be exposed for three years on a sea beach after quarrying. When the demand for brownstone was brisk, builders didn't always insist that it be properly seasoned, and when cold weather came the contained moisture froze and soon caused spalling.

These abuses and misapplications wrought widespread damage, and a great cry of protest went up. In 1883, Dr. Alexander Julien, an authority of the day, wrote a paper for the New York Academy of Sciences, titled *The Decay of the Building Stones of New York City*, in which he said: "All varieties of soft, porous, and untested stones are being hurried into the masonry of buildings in New York City and vicinity. In many of them the ravages of weather and need of repairs are evident within 5 years and resistance to decay for 20 to 30 years is usually considered wonderful. The coarser brownstones are exfoliating in the most offensive way throughout all our older streets and in many of the newer ones.

"Numerous house owners have expended tens of thousands of dollars in temporary repairs, patching and painting decayed stone and many of them have doubtless made rash vows to use hereafter brick, iron, terra cotta, wood—anything but stone. Instances are very rare in this city where the stone has been laid 'on its bed' with a deliberate regard to its durability."

Thirteen years later, Thomas C. Hopkins, assistant professor of economic geology at Pennsylvania State College, commented in a volume on Pennsylvania brownstones: "In New York and Philadelphia abundant evidence of decay may be found in many of the brownstone fronts, conspicuously so in the ground courses and in small railings and columns of the steps and porches, yet in many places the plain surface of walls is crumbling and scaling in a lamentable manner. It is said to be customary with some residents in New York to have the faces of their brownstone fronts rubbed with stiff wire brushes every four years to remove disintegrated material and keep the wall clean, and sometimes where the stone is much decayed the stone-cutter cuts away the loose material, thus giving the stone a fresh appearance without removing it from the wall, and in some instances it has been found necessary to replace the stone by a new one. I am informed that the replacing . . . is a much more common practice in England than in this country, as the rocks seem to crumble more rapidly in that country."

Despite these failures, the brownstone in many structures shows little or no evidence of deterioration even today after 50-75 and more years of service. There are, in fact, tombstones two centuries old with inscriptions still legible, while others could not be deciphered after only ten years' exposure. The difference is, of course, in the quality of the stone, and the unfortunate experiences indicate poor selection.

Brownstone has, essentially, the same mineralogical composition as granite or gneiss, and this is only natural since it was laid down in a sea receiving runoff from a granite-gneiss upland. Quartz makes up from 70 to 95 percent of the brownstone, and feldspar is the next most abundant mineral. Feldspar decays into various products, one of them clay, which can have a weakening effect. Mica, a constituent of granite and gneiss, is present in large quantities in New England brownstone but is scarce in that from Pennsylvania. It, too, is generally an element of weakness not only because of disintegration but also because the flakes all have a tendency to lie the same way—to make planes of easy cleavage along which the stone flakes and scales upon exposure. The brown color is caused by iron oxides which, in some forms, impart a red cast. Material low in iron may be yellow or gray, and as it occurs along with the brown in some sections was classed with the latter. Little light-colored stone was used, however, during the era under discussion. Some brownstone has a purplish tinge which is attributable to the presence of manganese oxides.

The hardness or durability of a given variety of brownstone depends as much on how it is put together as on what minerals it contains. One with sharp angular quartz grains that are bound together with a quartz cement will usually be much harder and more resistant than another with rounded grains held together with different cement, even though the second one may have the higher quartz content. These facts help to explain why some varieties outlast others and also remind us that many comparatively soft stones found their way into the market because they were easy and inexpensive to dress.

The Portland quarries were not only a leading source of brownstone but probably also the first quarries of any kind to be opened up in the colonies. Located on the east bank of the Connecticut River at a point opposite Middletown, the prominent sandstone bluffs could not escape attention. The settlers, who were English, came from Massachusetts and established a village at the site of Middletown prior to 1650. Up to that time the colonists had built their houses of wood or of fieldstone. There is a reference to the utilization of granite boulders scattered over the commons at Quincy, Mass., but seemingly no one thought then of quarrying stone, for the colonists sought to conserve the supply of this loose rock by voting in town meeting that nobody should "dig or carry off stone from the commons or undivided lands without license from the committee and payment of 10 shillings for each cart load."

As early as 1652, land grants for farming were made on the Portland side of the river and their holders crossed the stream in boats to till the soil, returning to the safety of Middletown at night. As in the case of Quincy, the rock was considered to be common property, and the inhabitants obtained whatever they needed for building purposes and gravestones. Outsiders apparently also began to take away portions in scows and boats, so much so in fact that the people of Middletown voted on September 4, 1665, that "Whosoever shall dig or raise stone at ye rocks on the east side of the river for any without the towne, the said digger shall be none but an inhabitant of Middletown, and shall be responsible to ye towne twelve pence per tunn for every tunn of stones he or they shall dig for any person whosoever without the towne; this money to be paid in wheat and pease to ye townsmen or their assigns for ye use of ye towne within six months after the transportation of the stone."

The practice must have persisted, however, for on March 4, 1715, the town voted to prohibit "all persons getting any stone in the Town Quarry on the east side of the great river for transportation out of the town" and provided a penalty that was to be divided "one half to him who complains and prosecutes, the other half to the town." On December 29, 1726, Ebenezer Gill was put in charge of the quarry with instructions to let inhabitants take stone for their own use and to give others the same privilege with restrictions.

The first private quarrying venture was carried on by James Stancliffe, who

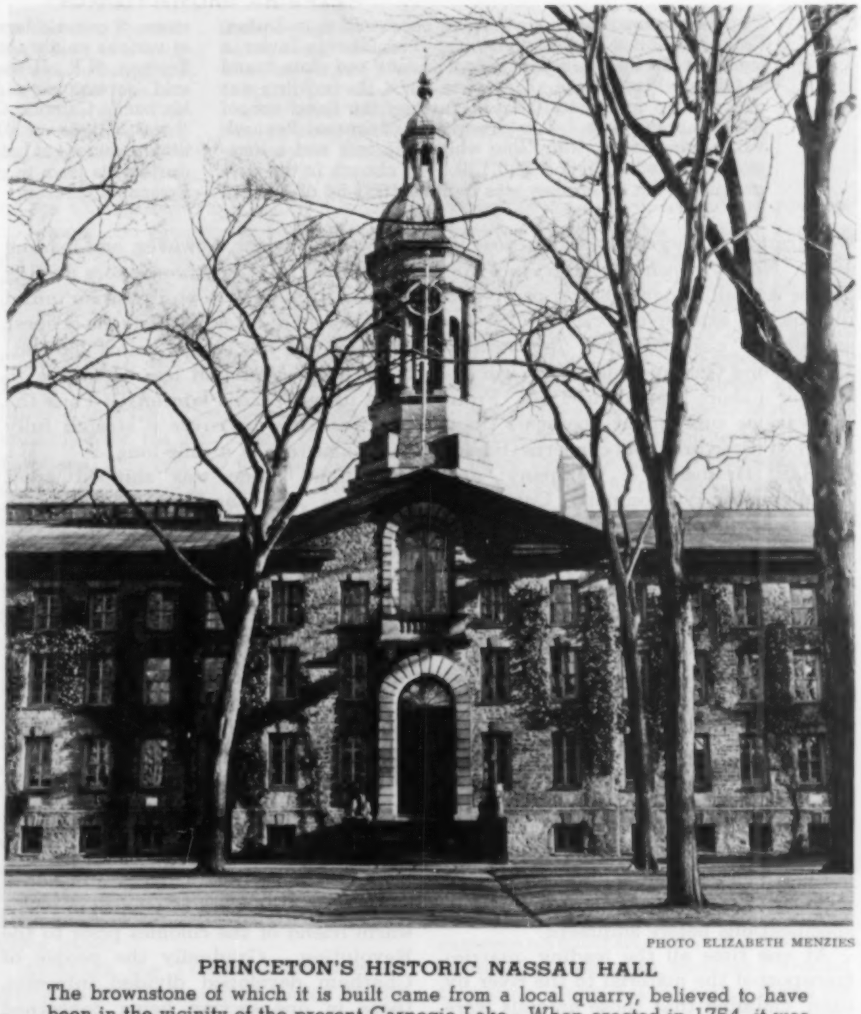
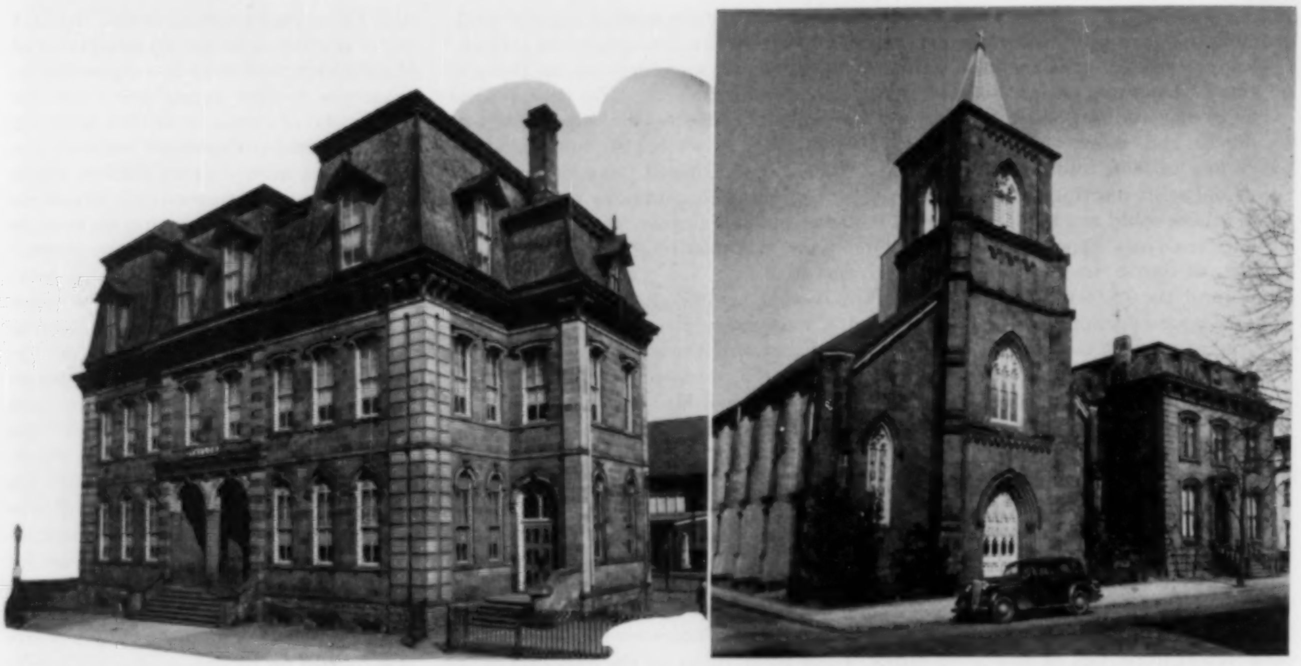


PHOTO ELIZABETH MENZIES

PRINCETON'S HISTORIC NASSAU HALL

The brownstone of which it is built came from a local quarry, believed to have been in the vicinity of the present Carnegie Lake. When erected in 1754, it was the "largest edifice of its kind in the British Provinces of North America." Interior walls are of brick made from clay from what was then the separate community of Jugtown, now within the limits of Princeton. On January 3, 1777, during the crucial fighting of the Revolutionary War, the building changed hands three times. It was the meeting place of the first Continental Congress and the first legislature of New Jersey.



TYPICAL BROWNSTONES

Two good examples of brownstone construction in Easton, Pa. At the left is Taylor School named for George Taylor, a signer of the Declaration of Independence and close friend of George Washington. Erected in 1871, the building was described a few years later as "among the finest school edifices in the state." It is constructed of dressed Pennsylvania brownstone, with Ohio whitestone trim and a limestone foundation. It cost $96,139. The church in the foreground in the other view was built in 1853-54 of Trenton stone, a generic term that included brownstone produced at various points along the Delaware River upstream from Trenton, N.J. It was erected by Presbyterians and later sold, serving as a dance hall for a time. It is now St. Michael's Catholic Church. The brownstone-front next to it was built about 100 years ago by Dr. Daniel V. McLean, then president of Lafayette College, and served as his home during his term in office. It is now the rectory of Trinity Episcopal Church.

was granted six acres for the purpose in 1690. Nearly a century later, in 1788, Shaler & Hall bought the property and did the first extensive work. In 1791 the same firm also acquired the nearby Brush Pond Quarry which had been active for a short time about 1767. From the various subsequent operators there emerged three principal concerns: Shaler & Hall; Brainerds & Company; and Middlesex Quarry Company. Consolidations in 1896 and 1906 put all the operations under one organization—Brainerds, Shaler & Hall Quarry Company.

The greatest activity began around 1870 and reached its peak in 1880, when more than 1500 men were employed and at least 50 ships were engaged in carrying the stone to Boston, New York, Philadelphia and other centers of population. The census for that year reports that 95.7 percent of the brownstone in Brooklyn buildings had come from Portland. An accessory business was the Connecticut Steam Brownstone Company, which operated a plant for sawing and cutting the stone to architects' specifications before shipment.

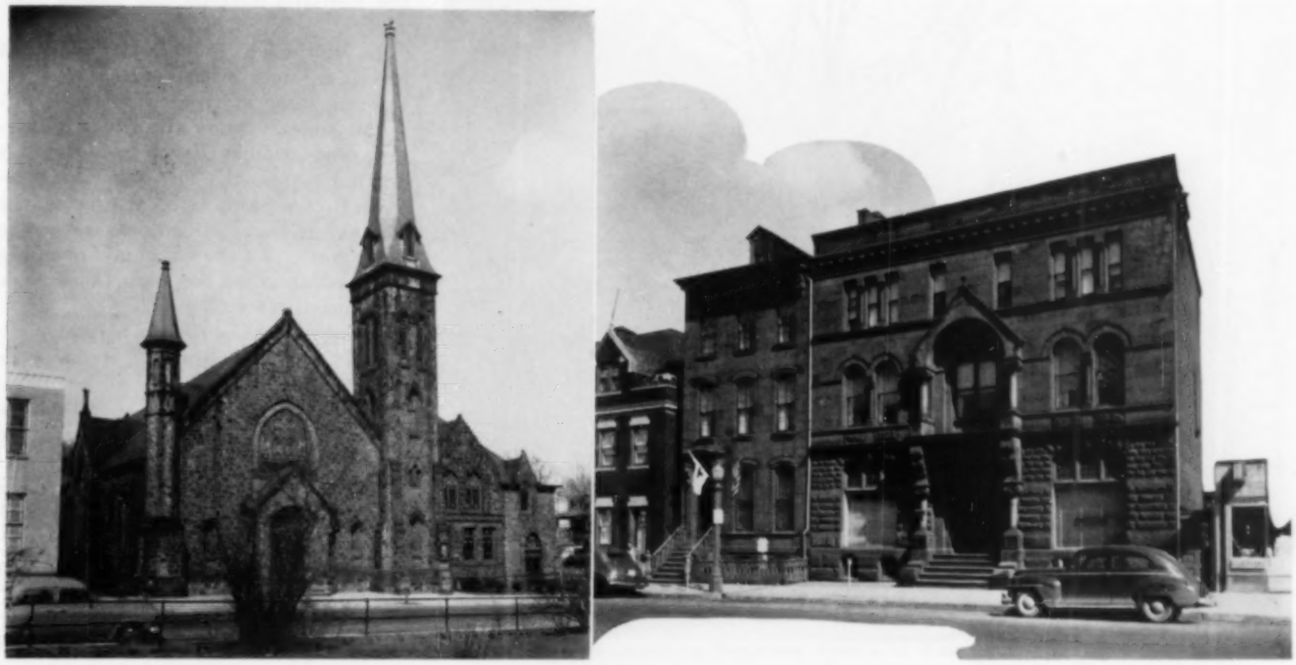
At one time all the leading quarries transported the material to the river by oxen, claiming that those animals were more efficient than horses. Later on a railroad spur was run into each quarry and a forest of steam derricks raised the stone, sometimes 200 feet and more, to the cars. Much of the output continued to move by water, however, and loading docks were built. Although core drilling indicated that the deposit had an initial thickness of at least 500 feet, the deepest workings did not extend below 250 feet, for it was easier and less expensive to open up new areas laterally. Thus the quarries grew to cover a stretch fully three-quarters of a mile long.

Portland stone was shipped great distances. Senator Flood of California built a mansion of it on Nob Hill in San Francisco, the material being sent to Newark, N.J., by boat for cutting and dressing and then crated and freighted around Cape Horn. During prosperous years, from 850,000 to 1,000,000 cubic feet of first-quality stone and twice that amount of coarse, cheaper grades were produced. Prices seem to have fluctuated rather widely, ranging from a low of 50 cents a cubic yard in 1844 to $1.26 in 1874, and then decreasing somewhat.

What is now Portland was originally a part of Middletown, but in 1767 it was set apart and named Chatham in honor of William Pitt, Earl of Chatham and a warm friend of the colonies prior to the Revolution. Gradually the people of Chatham developed divided interests, those in one section being concerned chiefly with quarrying, shipbuilding and commercial interests and the others inclining towards agriculture. Finally, in 1840, the first group petitioned the state legislature to divide the town and, after some stormy sessions, this was voted and agreed upon in July, 1841. The segregated area was originally named Middlesex, then Conway. Two days later it was changed to Portland, presumably because the great stone deposits were reminiscent of those on the Isle of Portland, England. The similarity between the two is limited, however, because the English stone that gained repute as a building material is a dolomitic limestone and not a sandstone.

Even after commercial quarries were established the town retained its holdings. In 1824, it leased them for the production of stone for Capt. Alden S. Partridge's military and scientific academy. The buildings were erected in Middletown and occupied for a time, but in 1829 the academy moved to Norwich, Vt. Two years later the vacated structures became the nucleus of Wesleyan University, and in 1834 the school was given a lease on the quarry for 40 years in order that it might get out material for additional buildings. The lease was in force until 1860. In 1884, the town's holdings were sold to private operators, the office of town quarry agent was abolished, and the residents lost the right to free stone that they had enjoyed for 200 years.

Although the first inhabitants of Portland were English, the Irish were not long in coming and they predominated in the quarries for a long time. An



CHURCH AND RESIDENCES

Here are more brownstone structures in Easton. The left-hand picture shows a Presbyterian church built of brownstone from Hummelstown, Pa. The main edifice left of the steeple was put up in 1871, the annex in 1896. The two residences in the other view were erected in the 1870's by Gen. Frank Reeder. He lived first in the plain-front building and then constructed the more ornate one adjoining it. The front, except for the round granite pillars, is of Pennsylvania brownstone. General Reeder enlisted in the Union Army when seventeen years old and came out a colonel when but a month past 21. Later he was brigadier-general of the Pennsylvania National Guard. His father, Andrew W. Reeder, was appointed by President Pierce as first territorial governor of Kansas.

old copy of the rules and regulations of Brainerds & Company sheds light on working conditions in those days. The year was divided into two seasons, summer and winter, and separate contracts for wages were made for each. The summer season started April first and ran until the company chose to end it. Actually, most quarries operated only eight months in the year, closing during the period when the stone was likely to be damaged by freezing. It was generally considered that it was safe to work the stone whenever the temperature was above 22°F. In all probability only a skeleton crew was employed in winter to maintain the property and equipment.

Resuming production on April first, the starting bell rang at seven in the morning and then progressively earlier as the season advanced until 6 a.m. was reached. After August 15, the same plan worked in reverse order. Noon recess was an hour long until May 1 and after September 15. Between those dates it was gradually lengthened to two hours, in accordance with the changes in starting time. Sunset was quitting time. In winter, the working day was from half an hour after sunrise until sunset, with one hour off at noon. The last regulation read: "Every man chargeable with intemperate habits, disobedience of orders, unfaithfulness in performance of duties, or with quarrelsome and immoral habits, whereby he would be deemed a bad citizen, may be discharged at the option of the Company."

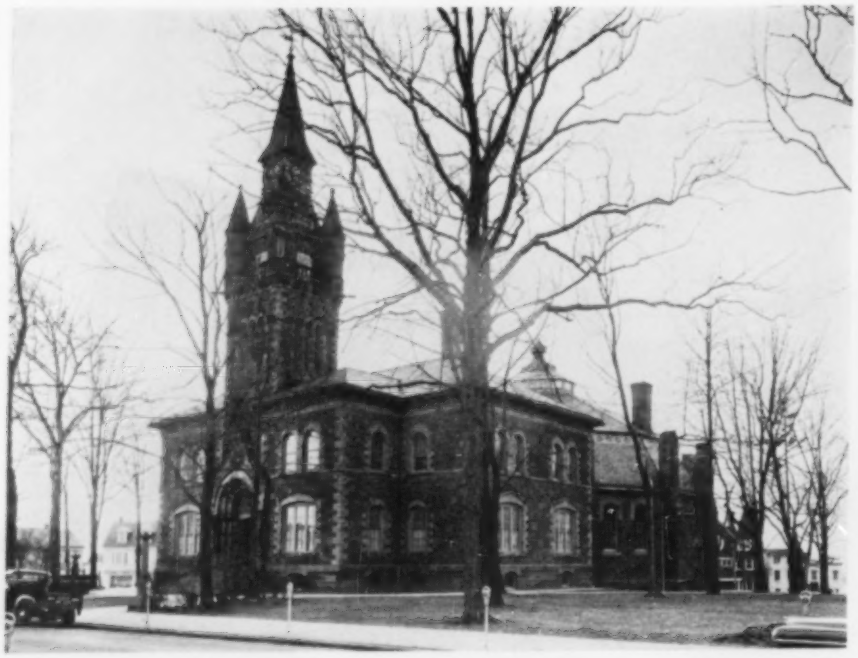
Among the prominent buildings constructed wholly or in part of Portland brownstone were the residence of W.H. Vanderbilt and the Astor Library, New York City; the home of George Pullman, Chicago, Ill.; the Union League Club, Philadelphia, Pa.; Alumni Hall, the library, and the art school at Yale University, New Haven, Conn.; St. Mark's Episcopal Church, Evanston, Ill.; the residence of Governor Murphy, Newark, N.J.; and the Canadian Bank of Commerce, Toronto, Canada.

From 1890 to 1896, inclusive, the value of the Portland output averaged $575,000 a year, but around 1900 the demand for the stone slackened perceptibly and sales in 1908 totaled only $55,949. Further decline ensued, but in 1926 there was a spark of revival. By that time the three large quarry interests had merged into the Portland Brown Stone Quarries, a title that persists today. The deposits are now owned by Brazos Bros who will gladly fill an order when it comes in. There is virtually no activity, however, and the once bustling pits are filled with water, as accompanying pictures show.

Although the Triassic sandstone extends up the Connecticut Valley to the northern border of Massachusetts, the only place besides Portland where it was quarried extensively was at East Longmeadow, between Springfield and Hartford. At one time at least five concerns were operating there. One of the quarries featured three shades of stone ranging from bright-red to brown under the trade names of Maynard, Kibbe and Worcester. In the better grade of East Longmeadow, bedding or cleavage planes were indistinct and the material could therefore be cut in any direction with comparative ease. Shipments were made throughout New England over a period of more than 25 years. The stone also was well known farther away, for it was specified for the Marshall Field Building in Chicago and the old Waldorf-Astoria Hotel in New York.

At least 50 quarries in Pennsylvania once produced stone classed as brownstone, but those at Hummelstown, a few miles east of Harrisburg, were by far the most important. The first regular quarry was opened there around 1800, and apparently supplied only local needs for several decades. Between 1853 and 1858, the material was used to enlarge the locks of the Union Canal and also to construct bridges and culverts for the Lebanon Valley Railroad that was then underway. Those applications presumably brought it to the attention of stonecutters and contractors in other sections, because the demand increased around that time. Soon it was being ordered for buildings in surrounding counties, moving either by rail or canal. In 1860, stone was extracted for the Dauphin County Court House at Harrisburg.

In 1867, Allen Walton, a Philadelphia



BUCKS COUNTY COURT HOUSE, PENNSYLVANIA

This structure at Doylestown, apparently as sound as when it was built in the last century, combines brownstone quarried at Yardley and Lumberville, also in Bucks County and on the Delaware River.

businessman, took over the management of the Pennsylvania Brown Freestone Company, organized by Henry Brown in 1860, together with the mill that had been erected in 1866. Walton introduced the stone in Philadelphia in 1868, and soon afterward in all the larger towns in Pennsylvania as well as in Baltimore. The financial panic of 1873 slowed down operations for a time, but in 1877 Walton and Philip Dougherty, who owned about half the stock, purchased all the assets of the concern and began operating it as the Hummelstown Brown-Stone Company. They increased sales, obtaining among others an order for the Bureau of Printing and Engraving Building in Washington, D.C. At the same time the stone became popular in Richmond, Va.

Walton bought out Dougherty in 1881 and entered the New York market in the following year. By 1888 he had furnished stone for structures including the Arcade Building in Cleveland, Ohio; in Chicago; in St. Louis, Mo.; for the Union Station, among others, in Indianapolis, Ind.; and even for a courthouse at Orlando, Fla. To handle this increased output, he built a 4-mile railroad to connect the quarries with the Philadelphia & Reading Railroad and erected a new sawmill at the working site, abandoning the old mill in Hummelstown.

In 1895, when two of Walton's sons were running the quarries, they were equipped with 30 steam derricks, one steam shovel, three steam-operated cable hoists and a complete line of steam drills, quarry bars and other tools. In the stone-dressing shops there were thirteen gangs of saws, fourteen stone planers, and stone lathes. Machine, carpenter and blacksmith shops also were provided, and the railroad was made up of four locomotives, three passenger cars and 33 stone-carrying cars. The labor force varied from 500 to 700 men. There would seem to be little doubt that it was the largest brownstone operation in the country at that particular time when the Portland quarries had passed their zenith.

In addition to the Walton-sponsored activities, eight other quarries were extracting stone at Hummelstown at different times. Some attained considerable production at certain periods, but it was not sustained. Thus the Hummelstown Brown-Stone Company, being the largest and best fortified, was the last to close down. All the dozen-odd openings from which stone has been taken have been inactive for 23 years.

Quarrying gave rise to a local community, called Waltonville, which had a population of around 200, subject to increase in the spring when operations resumed after the winter shutdown. It had a post office until 1918, a public school and a large general store run by the Brown-Stone Company. The laborers in the quarries were mostly Italians, Hungarians, Slavs and colored men. Every March, for 50 years, a representative of the company went to Virginia and recruited about 200 Negroes. They were quartered in several large boarding houses and were on the job from March to November, when they returned to their homes. The mill workers were mainly Scotch, English, Irish and Italian.

Stone quarried at Lumberville, Pa., some 20 miles above Trenton, was noteworthy for its hardness and wearing quality. More pink than brown, it is really a quartzite, and one company advertised it as a granite, declaring that the stonecutters refused to work it as sandstone and could not cut it with other than granite tools. Despite its hardness, the stone broke readily along the grain, and large blocks could be split with only

BRAINERD QUARRY OXEN

As many as 200 oxen were used at one time in the Portland, Conn., quarries, the animals being preferred to horses. Up to 40 yoke were hitched together to drag large blocks of stone to the boat landing. When railroad tracks were run into the workings in 1884 many of the oxen were no longer needed, but the companies continued to maintain them for some years, exhibiting and parading them annually at an agricultural fair. In 1896, only two yoke remained in the area.

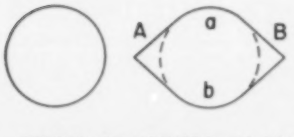
a few shallow drill holes. It was quarried at six different locations, all near the Delaware Division of the Lehigh Canal, which provided convenient shipping facilities. One company erected an aerial cableway across the Delaware River to reach the Pennsylvania Railroad tracks on the opposite shore. The material was used for some of the buildings in St. John's College, Brooklyn, and for many residences. But its greatest application was as Belgian paving blocks along streetcar tracks in Philadelphia, where it gave excellent service.

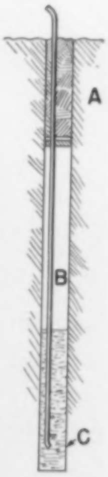
ABANDONED NEW JERSEY QUARRY

Nature has pretty well healed the 300-foot-long hillside scar that marks the site of the Shrump Quarry on Eaglerock Avenue in West Orange. When F.W. Shrump was working it in the last century the section was known as Pleasantdale. The property, idle since 1915, is now owned by Kenneth Shrump. It furnished stone for many homes in New York and a church in Caldwell, N.J.

Approximately 25 quarries yielded brownstone in New Jersey, most of them in the northern section but several along the Delaware above Trenton. Deposits that are now within the built-up area of Newark also were worked at one time. The highly productive Belleville or Avondale quarries, located 5 miles north of Newark, were opened prior to 1800 and were operated in boom times by the Passaic Quarry Company and the Belleville Stone Company of New Jersey. In 1881, they employed 375 men and had an output valued at $225,000. The workings were on the west bank of the Passaic River and both water and rail shipping facilities were at hand. The fronts of many of the finest homes between Sixtieth and Sixty-fourth streets and along Madison Avenue in New York came from there. Activities ceased soon after the turn of the century.

Farther up the Passaic at Paterson a quarry was operated extensively at one time, and at Little Falls there was one on each side of the stream. From the latter came stone for Trinity Church in New York City and the old customhouse and post office in Newark. The Newark quarries are reputed to have produced $120,000 worth of stone in 1881.





KNOX BLASTING PLAN

A round hole was first drilled, either by hand or machine, and then reamed with a special tool to the shape shown above, center. The theory was that explosive force exerted towards the smooth surfaces *a* and *b* did not tend to disrupt the rock as much as that exerted towards the points *A* and *B*, which started splits along that plane. The bottom third of the hole (section *C* and sketch at right) was filled with powder, the central space *B* was left open, and tamping was placed in the top, *A*. A slow-burning powder was used, and this, aided by air under compression, exerted a heaving action that broke the rock loose without disrupting it much. The previous practices of loading large holes heavily to produce large blocks often caused great waste and also weakened some of the stone used as building material.

Quarrying practices were much the same everywhere, with such variations as the nature of the deposits necessitated. In most instances, the strata were disposed horizontally, or with but a slight dip, with occasional more or less vertical joints or seams that facilitated extraction. To obtain blocks of a size that could be handled, however, the stone usually had to be broken in three vertical planes. In the early days, small trenches were cut in the surface along the desired lines and wedges driven in to free the block. This method was superseded by the plug-and-feather system, with the holes being put in by hand. It was also common practice to drill large holes and load them with powder, thus breaking out large blocks which were subsequently reduced in size either with hammers or by more blasting. Obviously, this not only resulted in much waste but also in shipping some stone that had been weakened.

Improvements followed with the advent of theKnox blasting method, which was patented and widely adopted. It involved drilling a series of holes along the line of fracture and reaming each one to elongate it in cross section so as to throw the force of the blast in opposite directions along the line desired, as shown in an accompanying diagram. In stone of medium hardness, the holes were usually spaced from 10 to 15 feet apart and were drilled to the bottom of the block to be extracted. Each was loaded with enough slow-acting black or Judson powder to fill one-third of it. Then an air space of the same length was left, and tamping was placed in the top third only. Firing was done electrically and all holes in a line were shot together. The Knox system was also used to reduce large blocks of stone to smaller sizes, in which case one hole sometimes sufficed to make the split along the desired line.

When mechanical rock drills became available the larger quarries adopted them, but the smaller ones mostly continued to operate by hand. They were preferably mounted on quarry bars for either vertical or horizontal drilling, and nearly all of them were driven by steam. Steam-operated channeling machines appeared around 1880, but seem to have been used only sparingly in the eastern brownstone workings, though they became more or less standard equipment in the Ohio quarries producing light-colored sandstone and in marble quarries generally.

While unsatisfactory service contributed to brownstone's fall from popularity, there were other more pertinent causes such as the rapidly developing use of concrete. The public's taste in building material also turned to the light-colored Indiana limestone, which is still shipped far and wide throughout the country. In at least one case, which resulted from a misunderstanding, the old and new favorites were combined. Graupner's Brewery, in Harrisburg, Pa., was built of brick and trimmed with brownstone from Hummelstown. Many years later, it was enlarged one-third and the addition was supposed to conform to the existing structure. Somewhere, however, the contractor got his wires crossed, for the new section was trimmed with Indiana limestone.

How Compressed Air Serves Nation's

FIRST SMALL AUTO ASSEMBLY PLANT

J. A. Newton

PHOTOGRAPHS BY THE AUTHOR

WHERE AIR TOOLS SERVE

Bodies and chassis are built up separately before they are brought together, and in the preliminary operations compressed air is of aid in many ways. Above, a workman is shown using an Ingersoll-Rand screw driver to insert Phillips-head screws in the molding around a windshield. A typical job on a chassis is running nuts with a Size 514 impact wrench on U-bolts that hold the rear springs in place (right).

THE country's first small automobile assembly plant, designed for a one-shift daily output of 25 cars, is Kaiser-Frazer's establishment near Portland, Oreg. This 200x225-foot reinforced-concrete factory on a 5½-acre site northeast of the city was completed last year at a cost of $350,000. The first car came off the line on September 21, and by early May more than 2000 others had followed it.

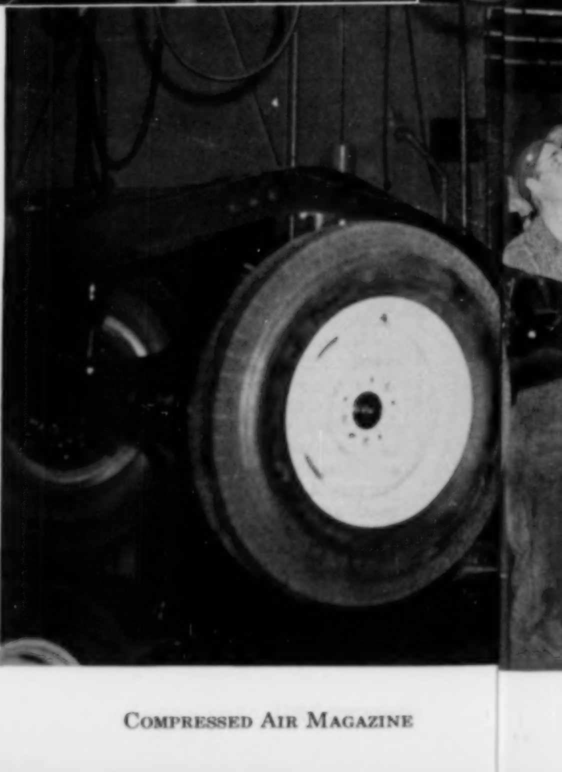
Kaiser believed that a small plant near northwestern markets would save shipping costs, result in better dealer service, give management closer contact with its working force, and improve the product. These objectives have been met, and in addition there has been a substantial reduction in office and supervisory help in proportion to production help.

The adaptability and the flexibility of compressed-air equipment led to its adoption for numerous operations. The "center" of production is a moving belt, which travels fifteen inches a minute to maintain the daily schedule. All subassemblies converge on this main line, with the chassis and bodies meeting at the starting point.

Primed bodies arrive from Willow Run, Mich., sixteen to a car, and are finished in a separate shop where Sundstrand pneumatic vibrating sanders and electric rotary sanders, as well as files, hammers, and torches, serve to remove rough spots and dents. The next stop is at a paint-spray booth, where a second coat of primer is applied.

After being baked in an infrared-light oven, the body is cooled, sanded, and washed. Sundstrand vibrators, this time provided with rubber pads and water-hose attachments, again go over it. Then the body is dried with compressed air. This is followed by a final coat of enamel, which is put on warm with Binks spray guns supplied by 15-gallon Binks pressure pots.

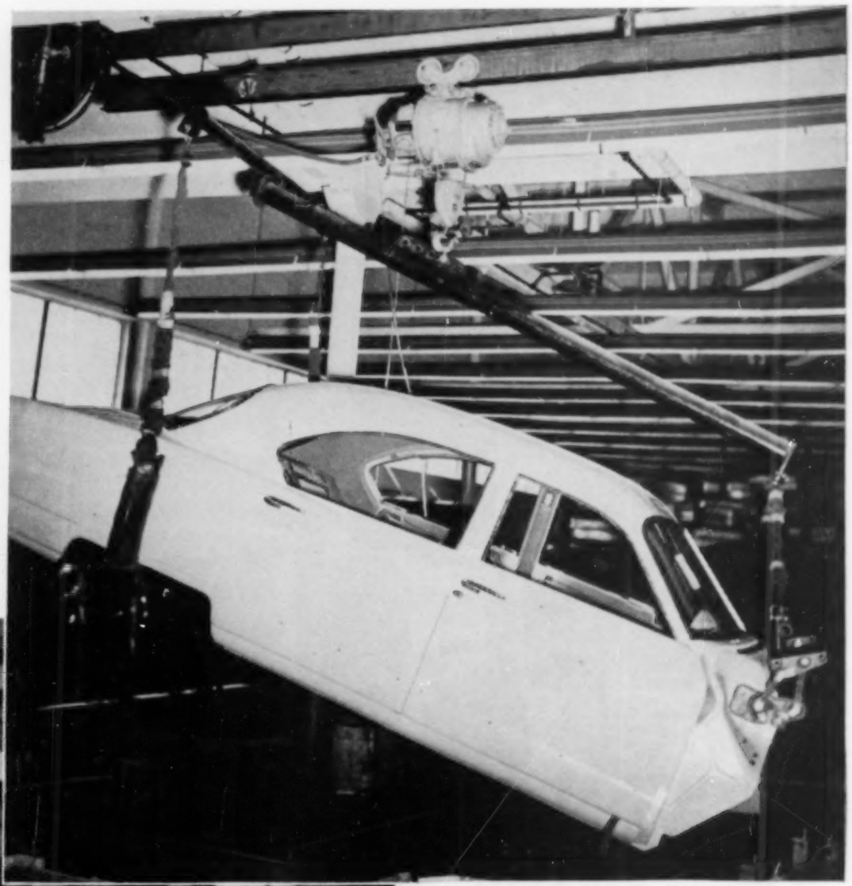
Workers at the next six stations take care of polishing, fitting some chrome on the exterior and fabric on the interior, building up the dashboard and instruments, and putting in front and rear glass. Much of the textile and cording around doors is tacked on with Springtramp-Eliminator Company air staplers.

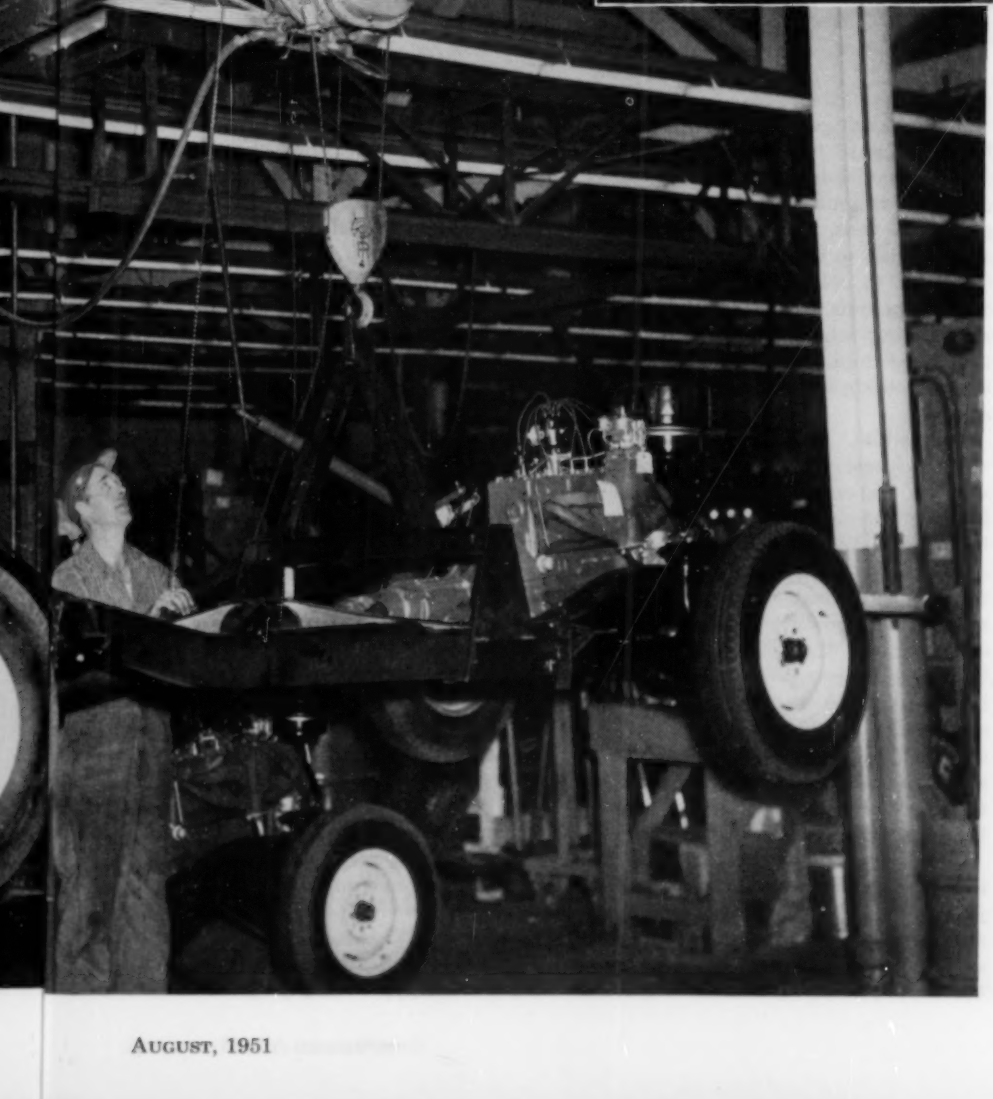


When these operations are finished, the body is picked up by an Ingersoll-Rand 2000-pound-capacity air hoist running on an overhead rail and is ready for the chassis.

Meanwhile the chassis has been traveling along its own line receiving a gas tank, drive line and differential, front-wheel assembly, a coat of black enamel, an engine, steering mechanism, and wheels and tires. Just about every job on the chassis line is expedited by means of air power. The assembly is moved from station to station suspended from I-R air hoists, and most of the wrenches used along the way are air driven. That is also the case with the engine subassembly—with the joining of the transmissions and engine blocks.

The assembled chassis is lowered onto the main belt line, after which the body is set on it and bolted and the door windows are put in. Then, as the belt carries the growing car along, trim such as door handles, molding around windows and windshield, and exterior chrome is applied, bumpers are attached, and seats are installed. Several of these operations are performed with the aid of I-R screw drivers.





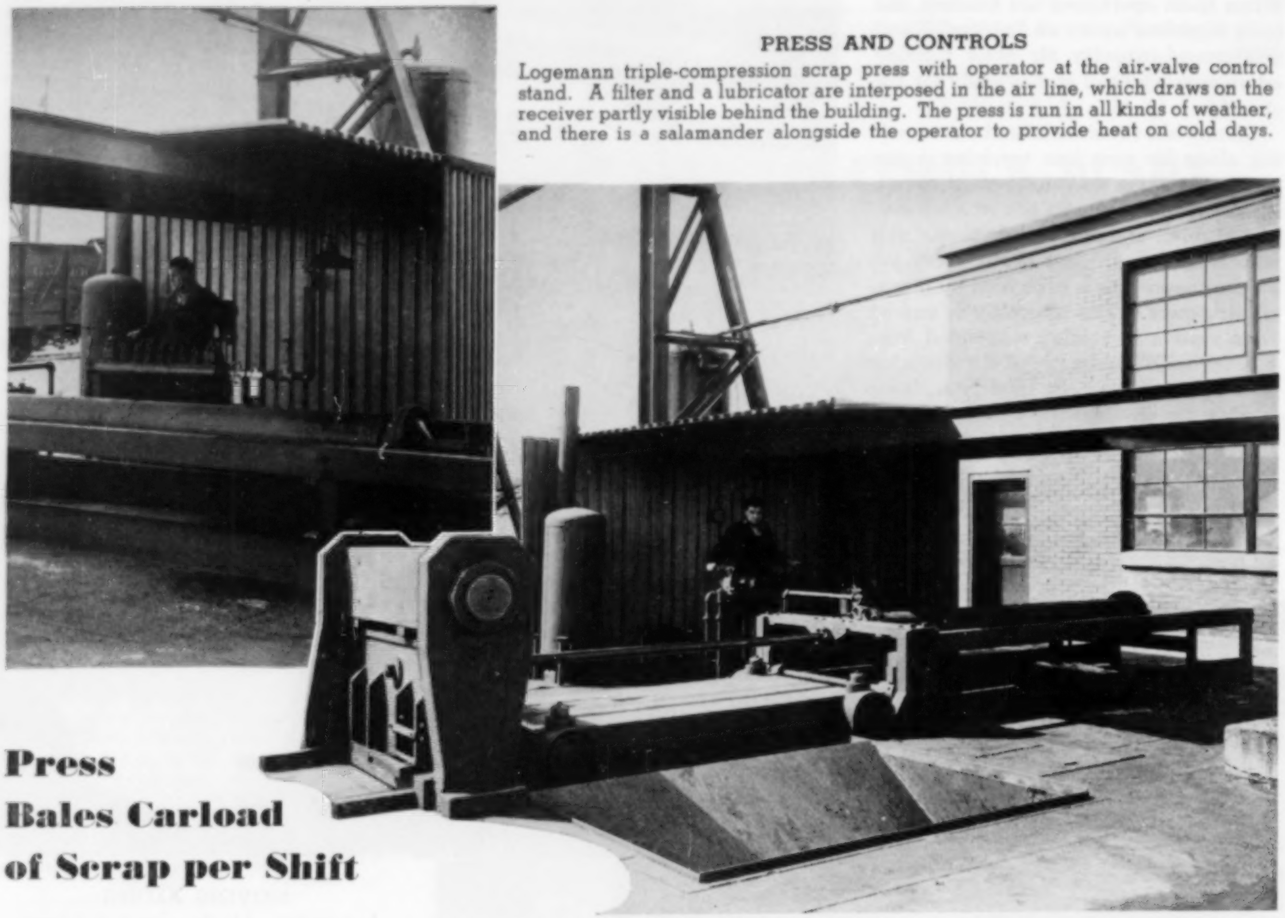
MOVING ALONG

Ingersoll-Rand trolley-mounted air hoists running on overhead rails carry both chassis and bodies from station to station during their assembly. The pictures above and at the left show 2000-pound-capacity units handling a frame and a body that are about ready to be joined together on the moving belt that constitutes the final assembly line.

The final major subassembly is the front end, consisting of fenders, radiator, and chrome details. This unit is brought to the belt by a 500-pound overhead air hoist and lowered into position. Following the placing of the hood, the engine is tested and the automobile leaves the belt line under its own power for final inspection.

Compressed air for these manifold services is furnished by an Ingersoll-Rand Class ES, 100-hp., belt-driven, single-stage compressor that delivers approximately 500 cfm. The intake air is cleaned by passing it through an American air filter, and the compressed air is dehydrated in an I-R aftercooler before it goes to a storage receiver 42 inches in diameter and 10 feet high.

Press Bales Carload of Scrap per Shift



PRESS AND CONTROLS

Logemann triple-compression scrap press with operator at the air-valve control stand. A filter and a lubricator are interposed in the air line, which draws on the receiver partly visible behind the building. The press is run in all kinds of weather, and there is a salamander alongside the operator to provide heat on cold days.

ALL sizable establishments that include metalworking facilities create appreciable quantities of scrap metal, and its disposition has become so important that it is usually handled by a separate department. Most iron and steel clippings, turnings, and the like are baled to conserve space in transporting them to steel mills for remelting. Large concerns find it economical and convenient to do their own baling, and equipment for this purpose has grown apace in dimensions and refinement of design with the increase in scrap emanating from industrial plants.

Take, for instance, a baler now in use at the Erie, Pa., works of General Electric Company. In one shift it takes care of all the ferrous scrap that collects during three shifts and replaces equipment that had to operate three shifts to keep abreast of the accumulating metal, most of which consists of clippings and trimmings from electric-refrigerator cabinets.

A new baler would have been in service sooner if it could have been obtained, but steel for building such machinery was allocated during World War II. Accordingly, F. E. Bliven, supervisor of salvage, and his crew got along as best they could with their old one. When it was installed in 1930, it was the largest of its kind and seemed plenty big enough to handle the clippings from the newly established refrigerator-cabinet division. It sufficed until 1937, spanning a period during which iron and steel scrap from plant operations averaged 20,600,000 pounds a year. During 1938-46, the average rose to 42,000,000 pounds, and from 1947 to 1949 it skyrocketed to 83,874,000 pounds. That was when a 3-shift baling schedule had to be instituted. All told, the old unit handled a billion pounds of material before it was retired.

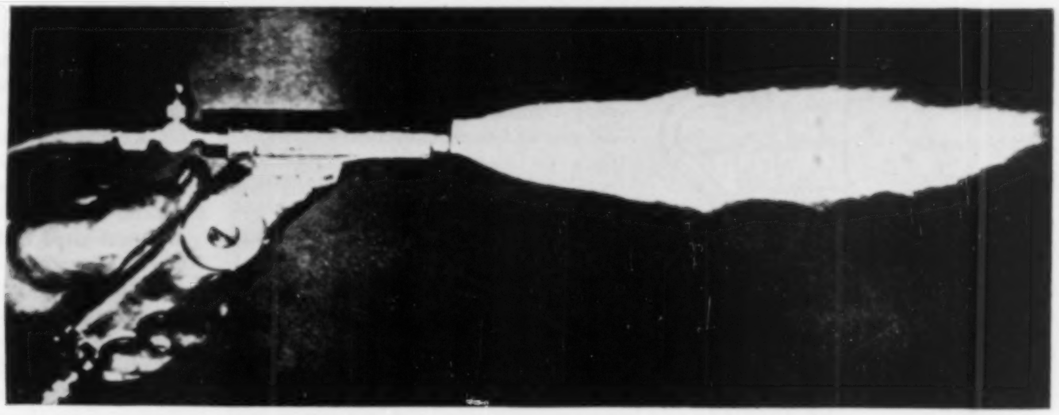
Meanwhile, manufacturers had developed larger, more efficient machines such as the new baler G-E purchased from Logemann Brothers Company, of Milwaukee, Wis. In addition to an increase in the capacity of the box in which the bale is formed, this unit has three rams instead of the two of its predecessor. Through their combined action, a bundle is compressed so compactly that it has 35 to 40 percent the density of solid steel. The bales are disgorged fast enough to fill a 160,000-pound car each night and are loaded direct, whereas in the case of the old machine they had to be piled until a carload had accumulated.

Most of the baler is underground, and it is of such proportions that 345 cubic yards of earth had to be excavated to accommodate it. Then, to set the monster 165,000-pound squeezer properly, 130 cubic yards of concrete was poured.

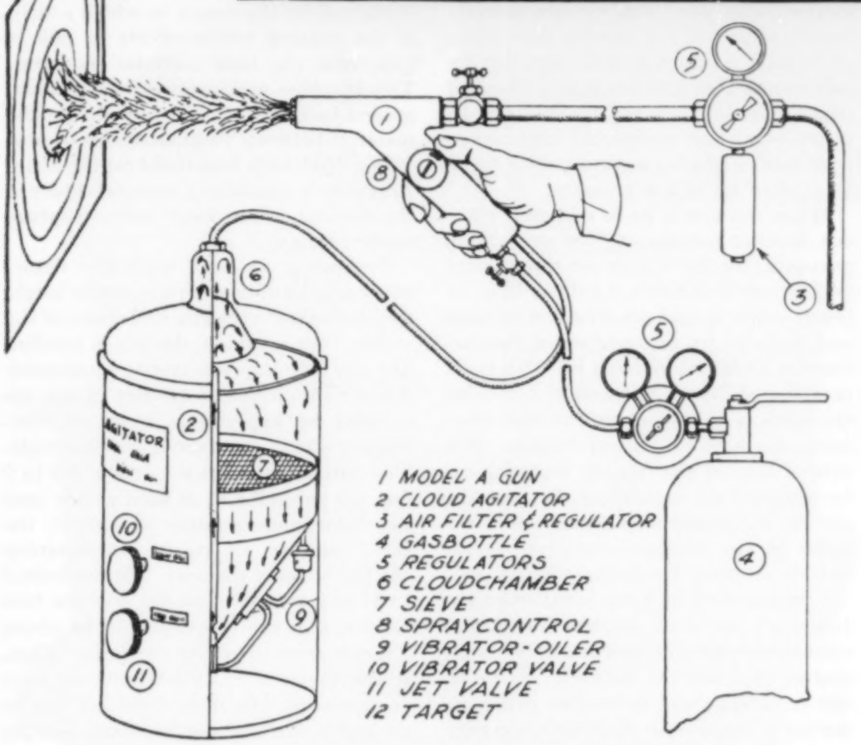
Two of the rams work in a horizontal plane. These are the low-pressure gathering unit, which is 11 inches in diameter and exerts 143.5 tons, and the 14-inch-diameter intermediate ram which applies 231 tons. After they have acted on the scrap, the third one comes up vertically from below to complete the bale by forcing it against the cover of the machine. This ram is 18 inches in diameter and exerts a pressure of 381 tons.

On their compression strokes, all the rams are actuated hydraulically, using oil which is put under pressure by a pump driven by a 125-hp motor. The two horizontal rams are retracted by air power, while the vertical one returns by gravity. Compressed air also opens and closes the baler's cast-steel cover, which moves on rollers, and operates the mechanism that transfers a charge of scrap from the receiving hopper into the press box.

The hydraulic valves are all actuated pneumatically, and the controls are located in a stand at the operator's station. The air is piped to the baler through a 2-inch line from the plant compressor house nearly 3000 feet away, and arrives there at around 90-92 psi pressure. A storage tank with a capacity of 90 cubic feet insures a volume sufficient to perform all the necessary services without an appreciable pressure drop.



LONG, LICKING FLAME
Close view of a plastic spray gun in action. For best results, a flame from 8 to 12 inches long is favored.



ELEMENTS OF FLAME-SPRAYING OUTFIT
Air and powder are mixed in the carburetor-type agitator at the lower-left and drawn into the gun by aspiration. Fuel gas and air are both fed under pressure.

Flame Spraying Plastics

Polythene Now Widely Applied by Heated Spray to Protect Surfaces Against Corrosion

John Starr

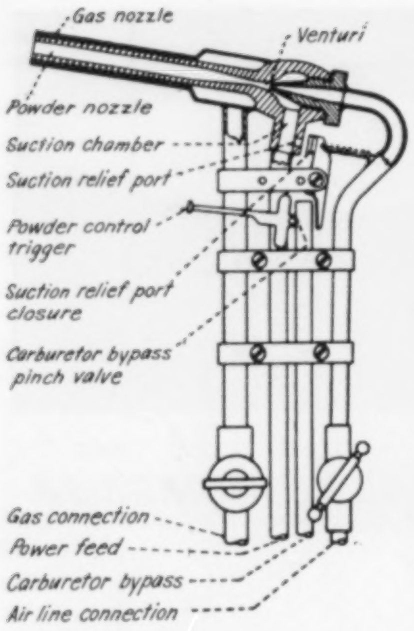
THERE has recently been developed a flame-spraying process for the application of thermoplastic materials that is said to insure exceptionally homogeneous and durable coatings even though they do not require supplementary drying or baking like other organic coatings. Described briefly, it is a combination of standard pneumatic methods used in spraying resinous materials and molten alloys, but calls for entirely different equipment because more heat is needed in metallizing than in liquefying thermoplastic powders, which normally would be dispersed in solvents for spray-finishing purposes. (Maximum temperature for thermoplastics is around 400°F; for metals 2000° and more.)

Sprayed powders solidify as the result of air cooling and, consequently, can be built up into coatings of minimum porosity and maximum thickness in a short period of time and without the poor adhesion, alligatoring, blistering and other difficulties that might be expected if conventional organic finishing liquids were similarly applied.

Theoretically, any plastic that can be softened or melted like wax may be flame-sprayed, but polythene, or polymerized ethylene, because of its unique physical properties, is considered one of the best of the "thermoplasts" for that purpose. It has a tensile strength of 1600 to 2000 psi with 300 to 500 percent elongation, a softening point of 220-240°F, and is resistant to acids, alkalies and oxygenated solvents but soluble in chlorinated hydrocarbons and hot aromatic solvents. Today, it is principally used to protect metals against corrosion.

Efforts to spray heated resins are not new. For example, in the application of lacquers with standard paint-spray equipment, low heat has been used for some years to minimize the need of thinners. Until recently, however, attempts to substitute heat altogether for solvents and thinners were unsuccessful. Back in 1943, when E.I. du Pont de Nemours & Company, Inc., of Wilmington, Del., first produced polythene, engineers of the organization envisioned the potential advantages of flame-spraying but failed to get the most desirable results because their experiments in this field were based on the use of standard metal-spray outfits.

The present-day practical status of the flame-finishing technique must therefore be attributed to special equipment such as was first developed by W.B. DeLong



DETAILS OF SPRAY GUN

The gun can be used to preheat surfaces before flame-spraying by shutting off the powder feed.

and E.V. Peterson of the American Agile Corporation, of Cleveland, Ohio. The work of these inventors has been described by them in detail, as follows:

"Preparation of continuous coatings from powder obviously requires fusion in order (1) to "wet" the target surface and (2) to coalesce the particles into a continuous film. It is necessary, therefore, to adjust the conditions of heating to those required to raise the particles to their melting point, but not seriously beyond, and to maintain them at this temperature for sufficient time to permit coalescence.

"Early experimental work with flame-spraying guns designed for metal powders proved that the flame was too hot and short to secure melting without degradation. Experiments on heating Polythene particles by dropping them through heated tubes indicated that the heating time necessary for melting at temperatures sufficiently low to avoid degradation was considerably more than could be obtained in projecting them from a gun in a flame or heated gas stream. Efforts toward devising a technique which would give a stream of completely melted particles were therefore abandoned and attention was given to the preheating of the particles in transit, followed by melting in place on the target surface.

"This was accomplished by using a spray gun in which the flame was relatively long and low in temperature, compared to those of conventional metal-spraying guns. It consists essentially of a venturi for drawing a mixture of polythene particles suspended in air into the gun, a tube for expelling the mixture from the gun, and a larger concentric tube for carrying the fuel gas. A flame that is lower in temperature and greater in length than those produced by most spray torches is obtained by mixing the fuel gas and combustion air beyond the torch nozzle, rather than by premixing them. Both city gas and acetylene have been used satisfactorily."

As an accompanying schematic drawing shows, the compressed air, the air-powder mixture, and the fuel gas are fed to the spray gun through separate tubes. Valves on the gas and air lines regulate the volume of the fuel supply and the velocity of the air-powder mixture, and a suction-relief port with closure permits on-off control of the powder flow. The air-powder mixture may be supplied by any means that will produce a cloud of thermoplastic particles in the atmosphere—such as a commercial carburetor-type feeder which requires only a small amount of air at low pressure.

When the gun is to be operated without feeding powder, as for preheating purposes, the carburetor air supply may be by-passed through a rubber line. A pinch valve is used to close the by-pass and to build up pressure when the carburetor feeder is again cut in. This is accomplished by simultaneously moving the suction relief-port closure and operating the powder control trigger. The rate of feed of the coating material can be adjusted by regulating the pressure of the carburetor input air, while the valve in the air-line connection serves only to alter the flame characteristics.

Coatings may be flame-sprayed on virtually all kinds of surfaces if sufficient care is exercised in preparing the latter and in applying the finishes. However, the technique was developed primarily for use in connection with metals, ceramics, and other materials with considerable heat resistance. Generally speaking, they are degreased, sandblasted, etc., in a more or less conventional manner, because clean, rough surfaces are essential to the bonding of any organic substance for optimum strength and permanence.

If the material to be covered is of a type such as metal that might chill the hot particles with undesirable speed, the surface of the target may be preheated to a temperature of 400 or 500°F so that the thermoplast will have a chance to flow and fuse before it becomes cool and solidifies.

Fusion is essential to the application of smooth flame-spray coatings, for otherwise they would be rough and porous like sprayed metal coatings. However, it is interesting to note that slow air cooling is not necessary to make flame-sprayed materials adhere to preheated surfaces; on the contrary, best results have been obtained where it was possible to cool them with a cold-water quench. This is undoubtedly attributable to the phenomenon of crystallization.

Several modifiers have been added to polythene to enhance its value as a flame-spray material. For example, finely powdered graphite or carbon black, mechanically mixed with 60-mesh polyethylene in quantities of about 0.5 percent by weight, has greatly improved the bond between the coating and preheated metallic surfaces in cases where air cooling was required for purposes of solidification.

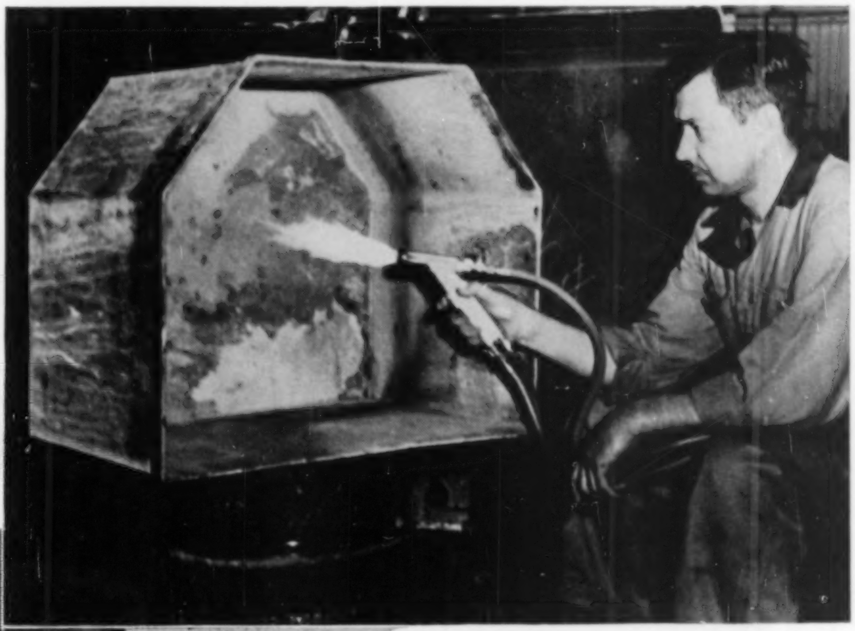
No satisfactory method for the quantitative measurement of the degree of adhesion of thermoplastic materials has as yet been developed. However, it can be evaluated by the extent to which a strip of the coating resists efforts to pull it free from the base material by hand. This involves making two parallel cuts, several inches in length, and slitting the material between them crosswise to provide a ½x1-inch fingerhold on the strip. Adhesion is considered unsatisfactory if the coating comes loose before rupture under tension.

Preheating is done with the flame-spray gun itself or with a separate torch, depending upon the size and shape of the article. For spraying, the gun is handled like any standard pneumatic equipment. Areas approximately 2x3 feet in size are covered by applying a series of overlapping strips, each about 2 inches wide. The gun is moved at a speed of 0.5 to 2 feet per second, and as soon as one pass has been made another is started, the total number, of course, determining the thickness of the coat. Flames from 8 to 12 inches long normally give the best results, and the target should be about 2 inches from the tip of the flame. Thus, if the material is to be built up to a thickness of 0.04 inch, finishing can be done at a rate of about 16 square feet per hour.

Frequently, powder particles appear to be solid at the time they strike the surface. However, they will fuse quickly and lose their identity if the work is done properly. Under most circumstances, surfaces do not require intermediate heating because the spray gun will maintain the proper temperature. However, in the case of sections less than 4 feet square, it is usually necessary to pause between passes so that the particles will have time to melt without becoming overheated. Operators can quickly tell when this happens because the material begins to smoke.

When a coat of the desired thickness has been applied, it is generally polished or glazed by the flame-spray gun with the powder supply turned off. When areas adjacent to a finished section are also to be covered, they are simply faired down to zero thickness for a distance of about 2-3 inches to provide essentially flat joints with pebbly or unglazed surfaces that will insure adhesion. But it is advisable to spray as much as possible of a given surface in a single operation so as not to lose the preheat.

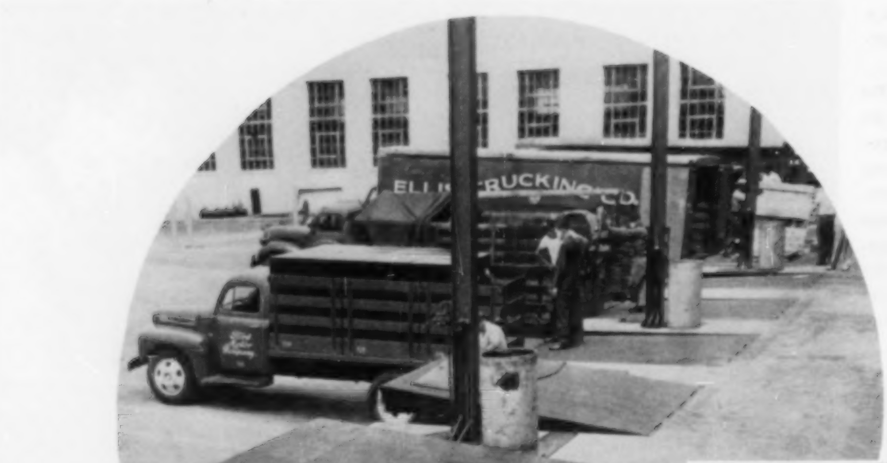
When an uncompleted job has to be allowed to cool to room temperature, as at the end of a working day, or when repairing spots in coatings, preheating must be done with extreme care to prevent damage to the material that has already been applied. This usually involves the use of a portable asbestos shield. Where coating is done progressively, bare surfaces have been protected with asbestos sheets to prevent them from being spattered with stray particles from the gun. Such particles may undergo considerable deterioration during the preheating process and, if numerous enough, may lessen the bond between the base material and the finish coating. Repairs are made by stripping away the unwanted material, roughening adjacent surfaces with a scraper, and applying a new coat with little or no preheating, depending upon the size of the area to be patched.



PROTECTIVE COATINGS
Metal tanks lined with flame-sprayed polythene will hold most corrosive liquids indefinitely without damage. Providing protection of this sort is the main use of the new process so far.

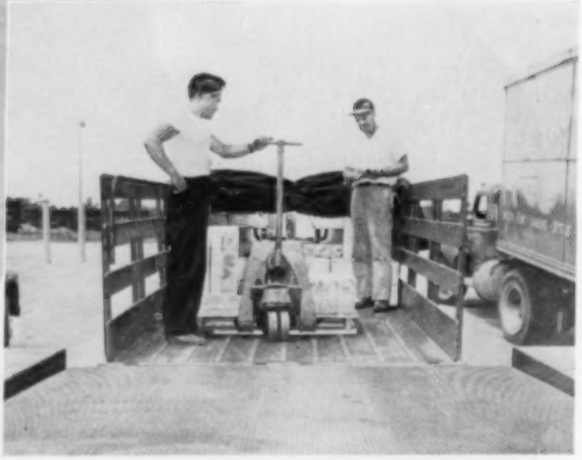
Exposure tests have indicated that polythene is probably the most chemically inert of all the synthetic thermoplasts at both high and low temperatures. These tests were made with saucerlike steel vessels, 8 inches in diameter, coated with the material and filled with a variety of reagents including, among others, sodium hydroxide, sodium chloride, formaldehyde, and hydrochloric, sulphuric, nitric, acetic and formic acid. Upon examination at the end of thirteen months it was reported that the containers had undergone "no change."

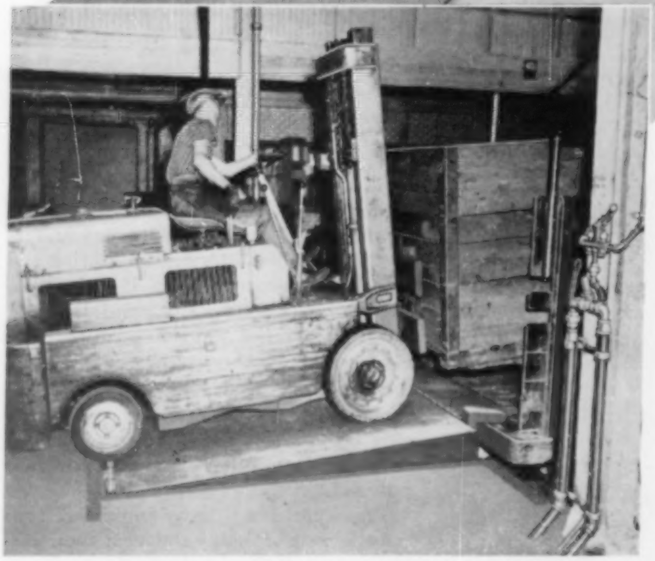
Besides serving as a protective covering for metals, thermoplastic materials are being used for making plastic objects in small quantities at comparatively low cost. They are flame-sprayed onto patterns and into mold cavities that are lubricated so that the coatings can be stripped off with ease. And, just like metal parts are assembled and repaired with gas welding equipment, so is the flame-spraying process being applied to assemble and repair molded or cast plastic products.



Tilting ramps put trucks and platforms

ON THE LEVEL





TILTING PLATFORM RAMPS

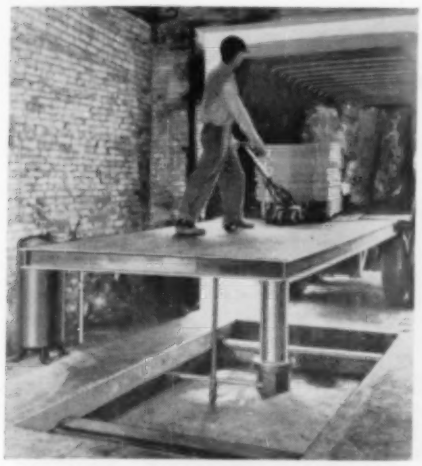
Hinged platform sections are shown at the top with some lowered and others elevated. Controls are mounted on the steel columns. In the view at the left is an industrial lift truck on a platform ramp, which is controlled by the air valve at the right. Note the hinged plate that extends from the ramp into the truck and the metal arm resting on the truck bed. With the weight thus borne by the truck, pressure in the cylinder under the ramp is released and the ramp rides up and down with the flexing of the truck springs. Pictured above is a platform ramp that has been lowered to bring it to a height even with the truck bed.

THE next time you see a truck or trailer back up for loading or unloading, notice how the vehicle bed and platform compare in height. The odds are great that the two won't jibe, that the difference between them may be anywhere from a few inches to a foot or more. Under such conditions loading or unloading will, obviously, be slow and difficult at best. With more and more of the world's merchandise being moved in trucks, enormous savings in time and money can be made by keeping those surfaces "on the level." Equipment for doing just that is made by The Wayne Pump Company, of Fort Wayne, Ind., and is being well received. Users include the Ford Motor Company and some of the common-carrier truck lines.

A choice of two types is offered for the purpose, and the result in either case is the same. In one instance, a section of the loading platform is hinged so that the outer end may be raised or lowered to coincide with the height of the truck floor. The other is a ramp that serves to raise the truck itself so that its bed will be flush with the platform. Both are operated by means of hydraulic cylinders. A similar device for use where there is no loading dock consists merely of a platform mounted on a lift. Loads are wheeled onto it while it is at floor level and then raised to the exact truck height. Conversely, freight from a truck is unloaded on it while it is elevated and is lowered to the ground.

As already indicated, the need for equipment of this sort is occasioned by the wide variation in the heights of loading platforms and truck beds. The former are usually built to accommodate a certain make and size of truck that happens to be in service at that particular time by a factory or firm. If, as frequently happens, the management decides that it can save money by switching to trucks or trailers of greater capacity, their larger tires and different construction generally result in a change in floor height. Then, too, deliveries to the average establishment are made by trucks that belong to many different common carriers and may vary considerably in this respect. As a matter of fact, it is reported that the beds of trucks range from 36 to 58 inches in height above ground level.

It has long been the custom to lay steel plates between platform and truck in an effort to overcome these inequalities. If the difference in height is small, the slope of the plate is low and it can be negotiated easily by men and industrial trucks or hand-hauled dollies. If there is an appreciable difference, however, trouble is experienced and it may be necessary to resort to bars, rollers, or special tackle to handle some loads. With the



VERTICAL LIFT

This type is for use in small plants that lack a loading platform. The lift itself serves as the platform and is shown here raised to truck-bed level. It is elevated and lowered by a hand-operated valve.

Wayne lifts it is possible to compensate for variations of as much as 20 inches in a few seconds.

The tilting loading-dock lift, as the platform ramp is termed, is normally 6 feet wide and 8 feet long. It is surfaced with a nonskid steel plate and is raised and lowered by a single hydraulic cylinder that is designed to carry live loads up to 15,000 pounds. It weighs 3800 pounds complete. Other sizes and capacities can be furnished. The standard truck lift consists of a movable section topped by a 10x14-foot nonskid plate. Its lifting height and capacity vary in accordance with customers' requirements, and the number of cylinders used depends upon these factors.

While the cylinders are of the hydraulic type, the actuating force may be compressed air or oil or other liquid handled by a pump. In either case, the pressure exerted forces the hydraulic fluid from a storage tank through a "deadman" control valve into the power cylinder. When it has reached the desired height and the valve is closed, the lift is supported on a column of noncompressible liquid and will remain at the set point indefinitely. The operation is controlled from a convenient station by an air valve or an electric push button.

F.S. Harshbarger, sales manager of Wayne's hoist division, states that the use of compressed air is advocated wherever possible and that a pump is recommended only when an initial pressure exceeding 125 psi. is required, or where service is continuous. "Generally speaking," he says, "our lifts are not raised or lowered oftener than once every 10 to 30 minutes, and this gives a small air compressor time to build up ample storage for the operation. A 10-inch cylinder, which is the smallest we ordinarily supply, has a lifting capacity of 8000 pounds when a pressure of 100 psi. is applied to the fluid. Consequently, the pressure of 80-100 psi. normally found in plant air lines is sufficient to raise the great majority of loads.

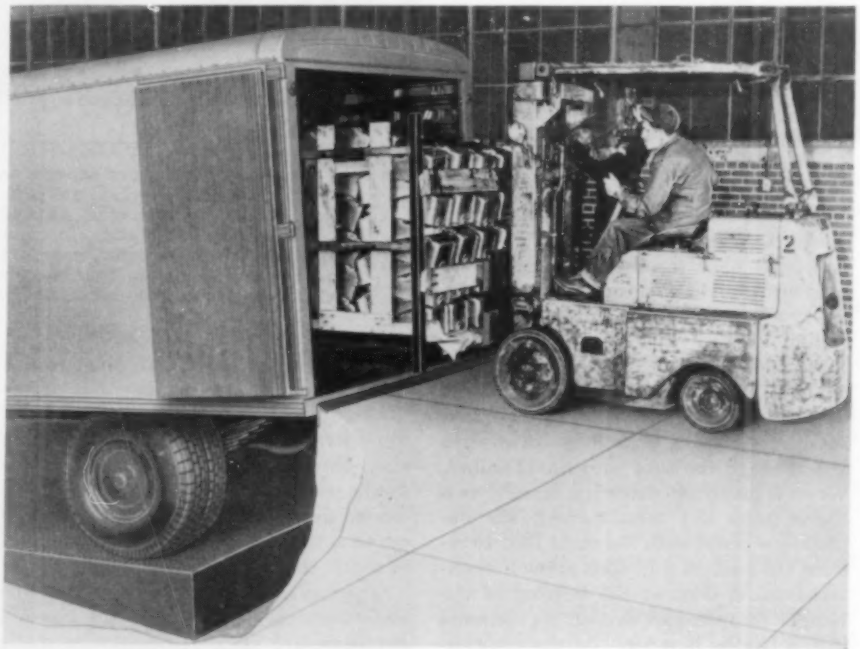
"In the case of our tilting loading-dock lift, where only the weight of the ramp must be handled, a pressure of 20-25 psi. suffices and the air consumption is only about 3 cubic feet per operation. It will be seen then that any plant that has an air system will have sufficient capacity and pressure to operate the ramps, and if air is not available, the installation of even a ½- or ¾-hp. compressor will meet the needs of several ramps."

The type of leveler selected depends upon local conditions. Where the loading dock is wide or deep, the platform ramp is preferred because it involves the least first cost and installation expense. The length of the ramp of course determines the slope. It has been found that the difference between a platform 44 to 48 inches high and the average truck bed is so little that the standard 8-foot-long ramp will permit hand or power-driven industrial trucks to negotiate the grade easily. A longer plate is better with a lower or higher platform. Prices of both platform and truck-lift ramps range from $1000 to $2500.00.

At the outer end of the platform type and near each edge of the ramp is a metal finger or arm that can be positioned to rest on the floor of the truck. Also at this end and between the fingers may be attached a hinged plate to bridge the small gap between the platform and the truck bed. Fork-lift industrial trucks carrying heavy loads can readily run over the plate. With the latter and the arms in use, the pressure in the cylinder can be released, and the hinged plate then rides up and down with the rear of the truck as its springs flex under heavy loads.

The third type, the vertically raised platform for use where there is no dock, comes in standard sizes of 6x8 and 8x10 feet, but it is available in other dimensions. It has a lifting capacity of from 6000 to 16,000 pounds and costs from $700 to $3000. This type has been adapted for bridging the space between two buildings with doors facing each other and floors level with railroad-car floors. The platform is elevated by a single cylinder under one end of it, and the other end is swung around to rest on the opposite doorway. When not in service, the bridge lies lengthwise against the building at the cylinder end and flush with the ground in a depression provided for it.

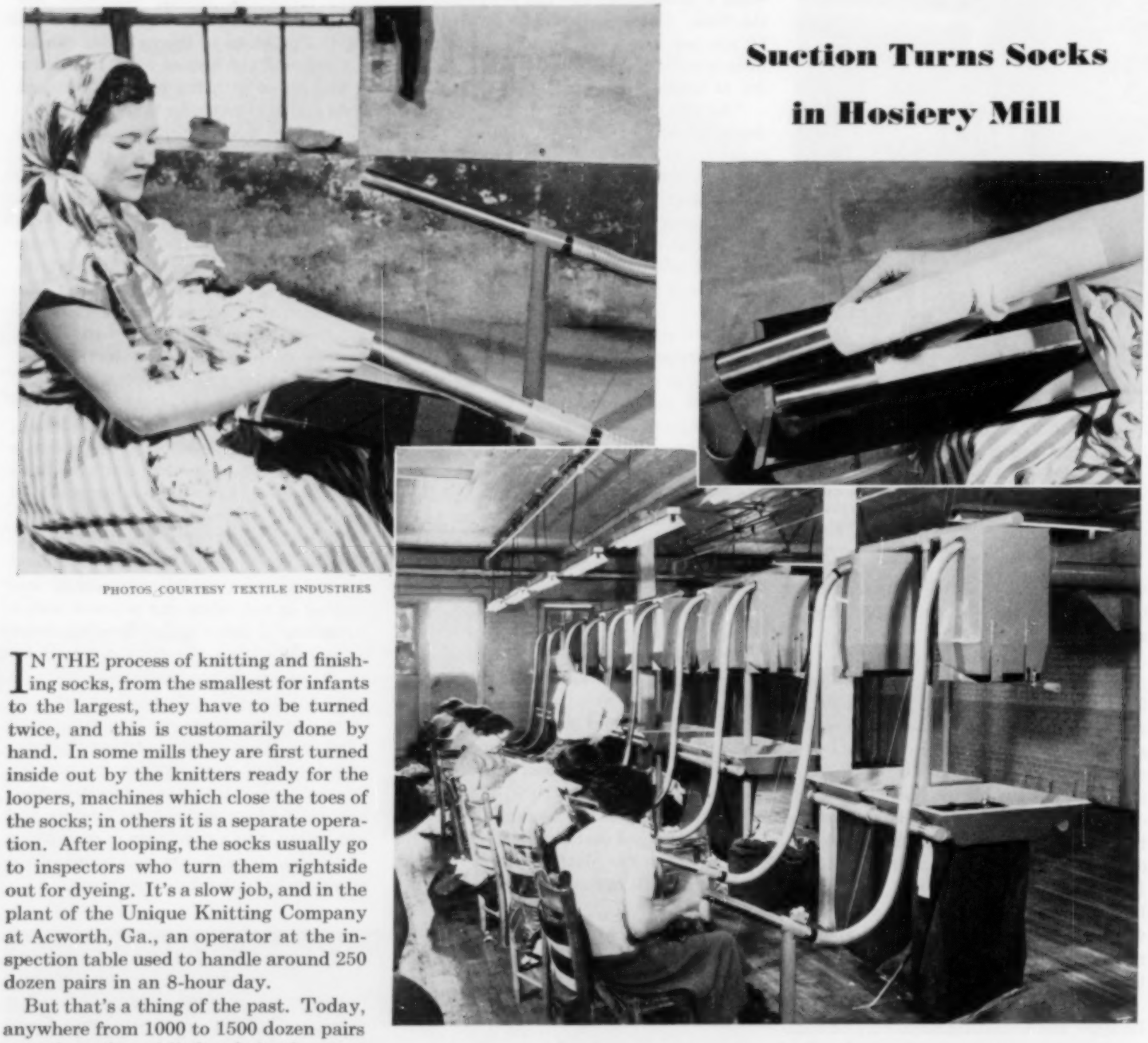
With the equipment described, truck-bed and platform heights can be aligned accurately in a matter of seconds and loading or unloading can proceed with a minimum of delay and difficulty. Some users report that the time required for these operations has been cut in half and more by these lifts, and others say that they are equivalent to doubling their available dock space. Other benefits noted include less worker fatigue, increased service from trucks because they are not tied up so long for loading and unloading, and a reduction in demurrage charges on freight cars as a result of the speed-up in unloading operations.



TRUCK LIFT RAMP

In this case the truck rather than the platform is elevated to even things up. The movable section of the driveway is visible at the lower left. Enough power is needed here to lift a truck and its contents, and this sometimes calls for more than one cylinder.

Suction Turns Socks in Hosiery Mill



PHOTOS COURTESY TEXTILE INDUSTRIES

FIVE-UNIT INSTALLATION

Each 2-tube unit in the group above is equipped with a 1-hp fan that has a capacity of 800-cfm. The socks, which are pulled over the inlet end as shown at the top-left, are inverted by the suction induced and deposited in the overhead chambers with counterbalanced doors. To empty them, each operator has a foot-control valve which, when depressed, reduces the vacuum and causes the hinged door to drop. Pictured at the top-right is the mirror arrangement that may be mounted beneath each tube so the socks can be turned and inspected at the same time.

IN THE process of knitting and finishing socks, from the smallest for infants to the largest, they have to be turned twice, and this is customarily done by hand. In some mills they are first turned inside out by the knitters ready for the loopers, machines which close the toes of the socks; in others it is a separate operation. After looping, the socks usually go to inspectors who turn them rightside out for dyeing. It's a slow job, and in the plant of the Unique Knitting Company at Acworth, Ga., an operator at the inspection table used to handle around 250 dozen pairs in an 8-hour day.

But that's a thing of the past. Today, anywhere from 1000 to 1500 dozen pairs pass through a girl's hands in the same interval, depending upon her speed of movement. This is made possible by a pneumatic hosiery turner invented by Joseph E. Kienel. It consists of two suction tubes each terminating in an overhead airtight chamber or hopper and of a fan-type blower that is driven by a 1-hp motor.

Sitting in front of the receiving end of the tube, the operator pulls a sock over it with the toe end towards her, the applied vacuum inverting it as it is drawn into and through the tube into the chamber. When a given lot made up of, say, two dozen pairs has been turned, she depresses a pedal with her right foot to reduce the suction and thus allow a counterbalanced door at the bottom of the hopper to open and deposit its contents into a bag or hamper. As the counterbalance closes the door, full vacuum is restored, the chamber is sealed, and the performance is repeated. At the same time a counter on the hopper is brought into play and registers the socks in multiples of twelve pairs. In this way a check is kept on the number that passes through the system in a given period and the operator is able to put as many as may be desired into the receptacle for further processing. Transfer at this point can be simplified by discharging directly on to a moving belt conveyor installed beneath the vacuum chambers.

Turning and inspecting can be done simultaneously after looping by use of a supplemental piece of equipment made up of two mirrors arranged in the form of a "V" and in an adjustable mounting. It is placed beneath the receiving end of the suction tube so that the operator can examine each sock all around without moving it after it is drawn out its full length. When these functions are combined, production drops to 800-1200 dozen pairs in eight hours, but it is still considerably greater than by the hand method.

In addition to quadrupling (not including inspection) the amount of work a girl can do, the pneumatic turner is easy to operate. It is also said to remove most of the excess lint and to fluff the socks, leaving them limp, a condition which insures good dye penetration. The equipment, which is being patented, is available with turning tubes of varying sizes and is built so as to conform with hosiery-mill practices.

Navy Divers Work at 10,000 Feet Altitude

FLOATING EQUIPMENT
The two rafts from which the divers worked, and some of the men that assisted in the operations.

OFFICIAL PHOTOGRAPHS, U. S. NAVY

AN UNUSUAL diving job was carried out last month in the high Colorado Rockies. To recover the body of a man who had drowned in Twin Lakes Reservoir, near Leadville, the Navy flew six trained divers to the scene from San Diego, Calif. Working in the frigid water at 10,000 feet altitude, they located the body after a 3½-day search.

The victim, 63-year-old Ralph Mauzy, of Denver, was fishing with three companions on June 10 when their boat capsized. All were saved by a rescue boat but Mauzy, who sank before he could be hauled in. During ensuing days the State Police Patrol, Denver Red Cross and Denver Fire Department all tried in vain to recover the body by working from the surface with grappling hooks and similar equipment. Through the efforts of U.S. Senator Eugen Millikin, of Denver, the help of the Navy was then enlisted.

The diving team was in charge of Chief Warrant Boatswain C.G. Sherwood and included Chief Metalsmith H.C. Easter; L. Ward, pipefitter first class; L.K. Guice, machinist mate first class; N.E. Goldsmith boatswain's mate second class; and B.G. Stewart, pipefitter second class. Upon their arrival in Colorado early in July, the Naval Air Station at Buckley Field, Denver, provided an air compressor and a crew of men under Lt. H.S. Conger to operate it and perform other necessary auxiliary surface duties.

Working from two rafts, the divers, in regulation dress weighing 65 pounds, descended, one at a time, and covered 600,000 square feet of the reservoir bottom before locating the body. In all, 30 dives were made, an average of five by each man. The plan was to walk first in a circle about 300 feet in diameter and then in progressively smaller circles until the entire area had been gone over. Meanwhile, one of the group on the surface kept in constant touch with the diver and followed his every move.

Each man stayed down 30 minutes, average time. At the 50- to 60-foot depth at which they worked the temperature of the water was 50°F, considerably colder than the sea water at San Diego. No difficulty in breathing was experienced by the divers because the pressure of the air fed to them corresponded to the pressure to which they were subjected at that depth, but all noticed the effect of the rarefied atmosphere when they were at the surface, and they classed the job as a "tough one."

They reported that the bottom of the reservoir is covered with soft, dark mud and three varieties of vegetable growth, much different from the kelp and other weeds found in the sea. Some of it was as tall as a man and so thick that the divers had to part it with their hands and arms to get through. When the sun was out, visibility ranged from 8 to 10 feet, but when the sky clouded over, it was so dark underwater that the search had to be suspended temporarily. Occasionally a large boulder fouled up the life and air lines, and a few times jagged edges threatened to sever the air hose. Although the men do not normally dive every day, the crew kept at the task until one of their number, Mr. Easter, came across the body in about 20 inches of vegetation in 52 feet of water.

The Buckley Field air compressor that was borrowed for the mission is an Ingersoll-Rand Type 30 three-stage, 4-cylinder unit driven by a gasoline engine. It is ordinarily used for servicing airplanes. Capable of discharging at a maximum pressure of 2000 psi, it was operated at a much lower pressure and the air was then passed through several reducing valves to bring it down to breathing pressure. The machine ran ten hours a day without developing any trouble.

SOURCE OF LIFE-GIVING AIR
B.G. Stewart, one of the Navy divers, shown with the air compressor which was pressed into service to enable the searchers to breathe underwater. The machine is ordinarily used for servicing airplanes at Buckley Field, Denver.

Atomic Standard of Length Available to Laboratories

FOR LABORATORY USE

Dr. W.F. Meggers is pictured at the right observing the circular interference fringes of green light from the electrodeless lamp (indicated by arrow) that was developed under his direction. It consists of a glass tube that is evacuated and sealed after measured amounts of argon and pure mercury have been admitted. Length measurements based on the interference pattern (background) can be made with an accuracy of one part in 100 million. Shown above is the lamp that has been under continuous excitation since October, 1949. It is excited by high-frequency radio waves (transmitter at right) which are picked up by the receiver on which the mercury lamp—the pencil-like object—is mounted.

FOR the first time, we are told, research organizations engaged in precision length measurements and related fields can provide their laboratories with an ultimate primary standard of length in the form of a spectroscopic lamp containing a single pure isotope of mercury. This significant announcement was recently made by the Atomic Energy Commission and the National Bureau of Standards.

Made under the direction of Dr. W.F. Meggers, chief of the Bureau's Spectroscopy Laboratory, the NBS-Meggers mercury lamp contains about one milligram of mercury of atomic weight 198 obtained by the transmutation of gold in a nuclear chain-reacting pile. In 1931, Doctor Meggers suggested that an ultimate standard of length could be obtained if one of the even atomic-weight isotopes of mercury could be isolated from the seven which occur all mixed together in natural mercury. At that time useful amounts of a single isotope could not be produced. In 1945 that problem was solved by subjecting pure gold to intense neutron bombardment.

Mercury 198 is sealed in a small glass tube and caused to glow brightly by the application of high-frequency radio waves. The light emitted by the isotope has very sharply defined wave lengths which are uniquely characteristic of mercury and remain unchanged with time. The new standard of length is based upon the wave length of the green light from the lamp. This wave length, near 21 millionths of an inch, is consistently emitted with a reproducibility greater than one part in a billion. Length measurements can therefore be readily made with an accuracy of one part in 100 million. New apparatus now under construction is expected to extend the accuracy to one part in a billion.

Although the world's official primary standard of length is still the distance between two lines on a metal bar, practically all precise measurements of length in the twentieth century have been and will continue to be made with light waves. Up to the present time the wave length of the red light from cadmium has been the standard. In 1927 the International Conference of Weights and Measures provisionally adopted the value 1,553,163.13 wave lengths of cadmium red radiation as equal to 1 meter. In 1948 the National Bureau of Standards proposed that the meter be defined in terms of the radiation from mercury 198. This is now under consideration. Present measurements show that 1,831,249.21 wave lengths of the green radiation from mercury 198 equal 1 meter.

Cadmium consists of six principal isotopes which are not separated and emit light of slightly differing wave lengths. When length measurements are made with this mixture a region of confusion results, and that limits the accuracy. Mercury, besides insuring much more sharply defined wave lengths, has other advantages over cadmium: First, the atoms are heavier, move about more slowly, and therefore disturb the wave length less; second, the light is obtained without heating the mercury to a high temperature and speeding up the atomic motion. The life of the NBS-Meggers Mercury 198 Lamp appears to be infinite. A lamp under continuous excitation since October, 1949, more than 10,000 hours, has shown no significant deterioration. Everything considered, mercury 198 provides a standard 300 percent more accurate than cadmium.

Recently, the Oak Ridge Laboratories of the Atomic Energy Commission succeeded in isolating practical quantities of mercury 202 by magnetic-separation methods. The advantages of this isotope over the 198 isotope are negligible except for certain important problems in atomic research. The wave length of the light from the former has not as yet been accurately measured, and the information essential to its use as an atomic length standard is still lacking. If needed for research in atomic physics, mercury 202 lamps can be obtained by special arrangement from the Bureau, which also handles the mercury 198 lamp. The latter is available to industrial and educational laboratories in this country and abroad. Applications should be sent to the Coordinator of Atomic Energy Commission Projects, National Bureau of Standards, Washington 25, D.C.

Science's Invisible Tools*

With Instruments the Naked Eye Cannot See Scientists Are Probing the Secrets of Organic Cells

Reprinted by permission from *The Reader's Digest*, May, 1951.

SCIENTISTS today have at their command a whole set of extraordinary new tools. Too small to be visible to the unaided eye, these micro-tools enable man for the first time to enter physically and to work within the fascinating world revealed by the microscope. The usefulness of micro-tools has been proved in a variety of ways; now they are helping scientists to probe deeper into the mysteries of cancer, the atom, and even the supreme mystery of the origin of life itself.

A bacillus, or germ, is about 1/25,000 of an inch in diameter. There may be a million in a drop of water. With a micro-pipette, a hollow tube slightly larger than the bacillus, the scientist can reach into the drop, select one particular bacillus, suck it into the tube, and take it away to study. He can even dissect it with a micro-scalpel.

Micro-tools are made of glass. A full kit includes pipettes, needles, hooks, scalpels, spatulas, forks, hoes and hammers; the working end may be as small as 1/250,000 of an inch in diameter.

Many highly practical uses have been found for these incredibly delicate instruments. The Bell Telephone Company was having trouble with its relay switches. Something apparently was fouling up the copper wiring. To the eye it looked bright and clean but the microscope showed an infinitesimal film of foreign matter. It was necessary to secure a bit of this film for analysis. To have tried to scrape it off with the finest needle would have been like shaving a man's face with a bulldozer. With a micro-scraper the job was easy. The substance, put through chemical tests, turned out to be a chloride deposit. It was traced to its source and eliminated.

The ability to make and use these minute tools has blossomed with a rush in the last few years. The culminating inventions were made by a brilliant French scientist. But the steps which led to his achievement go back more than 100 years.

It had long been known that if a glass rod were heated its tip could be drawn out into a needle or hook too small to be visible to the unaided eye. The problem was how to manipulate such tiny tools.

The first successful apparatus was constructed in 1859 by a Philadelphia physician, Dr. Henry Schmidt. His machine had three screws, each controlling the motion of the tool in one direction—much as the eyepiece of a microscope is adjusted. The trouble was that the motion of the hand couldn't be conveyed to the tool with precision or speed.

Nevertheless, with practice, scientists acquired some dexterity with those clumsy tools. Shortly after the beginning of this century, George Lester Kite, at the Marine Biological Laboratory in Woods Hole, Mass., was able to dissect some of the larger cells. His pupil Robert Chambers carried on his work. In 1931 Doctor Chambers made a tour of Europe, demonstrating his technique.

Among those who watched him in Paris was a young French biologist, Pierre de Fonbrune, a self-made scientist who had acquired a knowledge of biology from night courses at the Sorbonne. Now at the age of 30 he was a junior associate in a small research laboratory.

As Fonbrune watched Chambers probe into the structure of cells he became deeply stirred. It was like a visit to a far-off country hitherto only dreamed of. He resolved to devote his life to this diminutive world.

There were two problems: to make better tools and to find a better way of manipulating them.

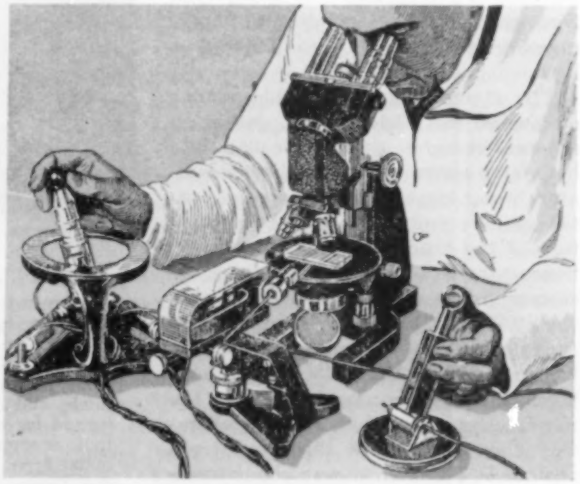
In six years of work Fonbrune solved the first problem. By endless trial and error he constructed an apparatus which he called a micro-forge. Essentially it was a tiny wire of irradiated platinum, heated red-hot. A miniature bellows regulated its temperature with precision. On it a tool could be drawn out to an extraordinary degree of fineness and quickly shaped into any form desired. Today there are more than 200 micro-forges in use throughout the world. In fifteen minutes an expert operator can make a dozen of the simpler tools.

The harder problem was to create a better manipulator. A new principle was needed—something to replace the inaccurate, jerky system of screws. One night Fonbrune dreamt that he had the perfect manipulator. With one hand he was grasping a handle which moved the tool with perfect precision. He woke to a loud crash. He had been grasping the stand of his bedside lamp, which now lay shattered on the floor.

But his mind still had hold of the principle—of the way to power his device. Compressed air. As Fonbrune finally developed it, pneumatic pressure, ingeniously controlled, transmits motion from hand to tool. The operator uses a single handle, which can be moved in any direction. The tool moves in the same direction as the handle, but on an enormously reduced scale. For example, if you move your hand to the left one inch, the tool moves to the left 1/2500 of an inch! You can make a precise movement of as little as one quarter of a millionth of an inch. So efficient is this device that the operator feels that his hand has direct hold of a tool which his unaided eye cannot see.

The significance of what Fonbrune had done was quickly recognized. Scientists in many fields began to clamor for the micro-forge and the manipulator. A licensed manufacturer in France and a sub-licensee in the United States are working hard to keep up with the demand.

In France micro-tools are used by one firm to develop larger and more flavorful strains of mushrooms. A clump of 100,000 of the thread-like spores from which mushrooms are germinated makes a tiny speck on a microscope slide. Armed with a micro-fork, the mushroom grower probes into the cluster, spreading it out the way a farmer spreads out a hayrick. He selects the larger and more vigorous spores and from them starts new cultures.



MICRO-TOOL IN ACTION

If the handle of the manipulator at the left is moved in any direction the tool it controls through pneumatic pressure will move in the same direction, but only one twenty-five hundredth as far. The hand-operated air compressor is at the right.

---

* *The Reader's Digest* condensed this article from *Curieux* (March 14, 1951) published by Curieux S. A., 6 Rue du Concert, Neuchatel, Switzerland. All rights reserved.

One of the chief factors in breadmaking is the quality of the yeast. A culture of fifteen billion yeast cells is about the size of two aspirin tablets. With micro-tools, chemists of the Fleischmann Company reach into the mass of cells and remove the more mature, with which improved cultures are made.

In experiments involving the use of rare or costly substances, micro-tools are invaluable. At the Hanford Atomic Energy Plant, for example, the amount of plutonium initially available for essential experiments was exceedingly small. Thanks to micro-tools, atomic scientists could work with infinitesimal quantities of plutonium and so "stretch" the supply almost indefinitely.

The most important practical results from micro-manipulation may be expected in the fields of biology and medical research. One result already attained is the making of better vaccines and serums. These cultures used to be made from clusters of many thousands of microbes, of various kinds and sizes and of varying toxic quality. Now for the first time it is possible to start the culture from one selected microbe picked out of the mass. This gives a more potent and efficient serum.

Neurologists can now isolate from a mass of fibers a single nerve fiber 1/5000 of an inch in diameter, and do it as casually as you would pick one strand out of a wire cable. They can dissect and observe this isolated fiber—studying, for example, how it repairs an injury. Doctors specializing in diseases of the blood can open a single red blood corpuscle, insert a malaria germ, and watch its action.

Micro-manipulation may also prove important in cancer research. Now the researcher can isolate a single cancer cell, remove its nucleus, and try to find out how it is fed, why it multiplies so fast, how it differs from the normal cells around it.

The Department of Zoology at King's College, London, has an interesting experiment underway. With the micro-tools scientists take a common, one-celled ameba which has been treated with cancer-producing chemicals. They extract its nucleus and insert it in an ameba which has not been treated. Thereby they hope to find out whether the cancer-producing agent acts on the nucleus or on the surrounding cytoplasm of a cell.

At present Fonbrune, now head of the Pasteur Institute's laboratories, is working on a new apparatus. If successful it will greatly extend the field of vision in which micro-tools can be used. Instead of a field the size of this letter *O*, it will be as large as a 50-cent piece. It may also make possible a number of new operations, such as welding together bits of metal too small to be seen, and the construction of radar lamps invisible to the unaided eye.

Micro-tools are opening up a new area for pioneering scientists. By work in this infinitesimally small world, man is able to press forward in his study of the larger world around him.

Worked-Out Mine Serves as Storage Place for Oil

PARADOXICALLY, after digging wells and getting oil out of the ground Sweden puts oil in the ground and has what is probably the most unusual storage reservoir for crude to be found anywhere. It's a worked-out feldspar mine at Flaxenvik, on the Stockholm archipelago, that's been in service for a year and a half with good results. The oil is stored to a depth of 230 feet from sea level and is pumped in and out 50 feet below sea level. It is prevented from falling below that point by filling the bottom 80 feet of the mine with water and maintaining it at that depth. The water is handled by pumps installed above ground and is delivered through drill holes extending to a passageway driven, roughly, on the 260-foot level.

The oil pumping station is blasted out of rock 90 feet underground, and in an adjacent chamber is the boiler plant of a hot-water system. This consists of radiators which are set up in a special outtake gallery and can raise the temperature of the crude to 100°F. to keep it flowing freely. Projecting out into the storage area is a 2-inch-diameter heating tube, 1500 feet long, that lowers the viscosity of the upper layer and prevents it from sticking to the walls when the oil level is raised by pumping water into the mine. After more than a year's operation the temperature there registered around 50°, though it was about freezing at the start. The temperature of both the oil and the water can be measured electrically at 32 points throughout the depth and length of the mine.

To provide access to the underground chambers it was necessary to sink a shaft, which also contains a stack to carry off the smoke from the boilers. In addition, the job of conversion involved closing a small opening with a concrete plug and roofing over the main opencast with a concrete dome 8600 feet square. Both were covered with broken rock. The surface plant is made up of three small buildings and a pier with pipe lines through which the oil is pumped into the storage space direct from tankers.

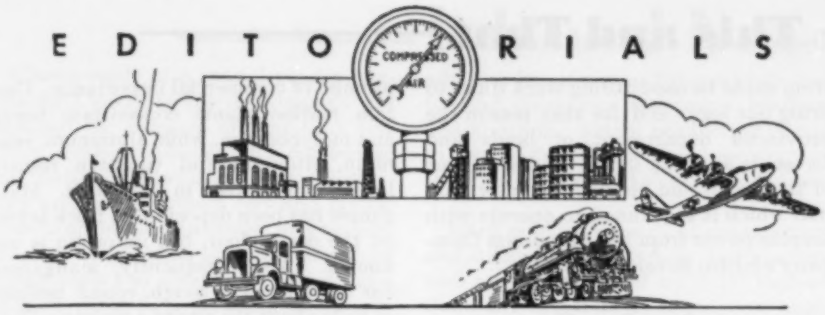
Why isn't it necessary to line the walls of the Flaxenvik mine with metal plates to prevent the oil from seeping out? We are told that at no point throughout the area is the water table less than 12 feet above the maximum oil level. It is the pressure of this ground water that holds the oil in check. Water seepage into the oil is of no consequence, it is reported, because the drops sink—do not emulsify—and form a layer of bubbles where the crude and underlying water meet. The bubbles are coated with oil, and when the film bursts, the water is released and mingles with that in the bottom of the mine. It has been determined that the oil's water content is less when it is in storage than when it comes from the tankers. Any contained impurities tend to settle and run out with the crude under normal conditions of storage. But in the case of the mine, where the oil is drawn off at the top, it is practically free from foreign matter.

The idea of using the abandoned feldspar mine for oil storage was conceived by Harald Edholm, superintendent of supplies for Sweden's Hydroelectric Power Board, and was planned in cooperation with an expert of the Swedish navy. It took one year to complete the work at a cost of $3.50 per cubic meter (1.3 cubic yard) of storage, as compared with about $25 for metal tanks set in chambers blasted out of rock. The expenditure for such underground tanks exclusive of excavating would have been approximately $10.50. To inspect their subterranean storage "tank" the engineers row around on the surface of the oil in boats.

COLLAPSIBLE DRUMS

Occupying comparatively little space when empty, 2500 of these 55-gallon synthetic rubber-fabric containers suitable for shipping oils, greases, emulsions, paints, dry powders, pharmaceuticals, and many chemicals can be returned for reuse in a standard boxcar that accommodates only 300 of the metal type. Molded in one piece by the United States Rubber Company, they are provided with a hook for lifting and can be rolled and stored like ordinary drums. Because they are filled when in the collapsed condition they do not need a vent, and their rounded corners permit complete withdrawal of the contents.

EDITORIALS



A VANISHED FASHION

THERE have been few changes in the public's building habits to match the shift from brown-hued sandstone. As an article in these pages points out, the transformation was not only complete but also remarkably abrupt. Beginning around 1850 and reaching its zenith about 1880, the brownstone craze started to fade soon after the turn of the century. Within another decade its doom was sealed, and in 1908 State Geologist Henry B. Kummel of New Jersey wrote: "In the light of present tendencies, it does not seem probable that this stone will regain its prominence at any time in the near future." So far his words have proved prophetic.

The change from brownstone had a severe impact on the quarrying industry. At the peak of the stone's popularity the workings at Portland, Conn., alone did a million-dollar annual business, and the aggregate shipments from the scores of quarries then operating along the Triassic sandstone belt of the eastern states must have run into many millions at a time when a dollar bought much more than it does now. Here was truly a riches-to-rags industry.

Brownstone apparently became popular originally because it was within convenient reach of pioneer builders. Eons of erosion by the Connecticut cut through the strata at the present site of Middletown, leaving prominent bluffs standing on the opposite side of the river. The stone was so easy to find and so readily accessible that the colonists began using it almost immediately. Word of it spread quickly, and people were soon coming from considerable distances to obtain it.

With virtually no roads in existence, such commerce as there was moved by water. The Portland deposits rose right out of the river, handy for loading the stone on boats or scows, and it was not long before appreciable quantities of it were moving down to New York and then beyond. So was born not only the nation's first regular quarrying industry but also one of its first boat-building enterprises. The seed thus planted grew, and in time Portland boasted extensive shipyards.

While the Portland quarries sprang up largely through chance and circumstance, other sources of brownstone were deliberately sought out. Unfortunately, all of them did not yield stone on a par with the Portland product, and therein lay one potent reason for the wane in brownstone's popularity. The demand was so great that many buyers took what was offered them without proper investigation and awoke a few years later to find that their fashionable brown-fronted homes were literally crumbling away.

Many varieties of the stone were nevertheless highly durable, and where they were properly laid with regard to thwarting the action of frost, the results were satisfactory. Thousands of sturdy brownstone structures still stand unscathed by decades of weathering, and many of them are undeniably beautiful. However, the unrelieved monotony of multiple and identical brownstone fronts in New York was not destined to be considered attractive for long.

The brownstone quarries brought about a need for more effective methods of extracting and working stone, and that led to notable improvements in the technology of those arts. Among them were advances in rock-drill design, and especially in mountings that enabled the drills to do their job better and faster. The development of channeling machines was accelerated, although in the end the sandstone quarries of the East did not become large users of these devices. The quarries also contributed to the improvement of pumps. Many of the early workings could not be carried deeper than 60 to 100 feet because of the problem of handling water. But when better pumps appeared, the openings at Portland were carried down as far as 250 feet.

One of the interesting things about the Hummelstown, Pa., quarries was the excellent relations established between employer and employees in a day when labor was accorded few privileges in most industries. Allen Walton who headed the largest quarrying venture there, apparently had his workers' welfare at heart. We read, for instance, that every married employee received a turkey at Christmastime, a gesture that is not overly common today. Mr. Walton was a Quaker and lived up to the beliefs of his religion.

Governors of several states lived in brownstone mansions and, if we are not misinformed, the governor of Pennsylvania, at least, still occupies one. Many of our first railroad bridges were constructed of brownstone and were noteworthy for the beauty of their lines and their masonry.

The brownstone era will go down as a page in the history of American life. It will tell of a generation or two of substantial people who liked life's baubles but, nevertheless, believed in building their houses and their lives on stone footings. Perhaps we could do with more of that sort of philosophy today.

GOOD BUSINESS

ONE of the saddest sights in industry is a maimed employee serving as a gateman, receptionist or in some similar post where he is occupied so little that he obviously has too much time to think about his misfortune. Usually, such people once actively used their muscles or brains, or both, which makes their present plight all the harder to bear. There was a day when these victims of accidents were about the only physically handicapped persons industrial concerns would hire, but that condition has fortunately changed.

Nowadays, crippled, blind and deaf men and women are earning livelihoods, not as pottering pensioners but as useful interested workers. Despite their handicaps they have mastered skills that make them valuable to their employers and enable them to earn their way and retain their self-respect. Nation-wide surveys show that such people, when properly placed, make good producers. They work safely and they stay on the job.

Six years ago Congress established national "Employ the Physically Handicapped Week" and thus called to the attention of employers the desirability of hiring these persons. Since then 1,300,000 with impairments of one sort or another have been placed in jobs that match their capabilities. This year the week will be observed October 7-13. Already the Department of Labor is urging industries to look over their labor needs and see where a physically handicapped man or woman might be gainfully occupied. During the last war they demonstrated clearly that they could fill many gaps capably and release physically sound workers for other duties. With the nation heading into another great defense-preparation effort, training and hiring these people is a sensible way of overcoming the impending labor shortage and, at the same time, of contributing to the rehabilitation of deserving citizens, many of whom are war veterans. The slogan for the week is: "Hire the handicapped, it's good business."

This and That

Locomotives Feed the Scrap Pile

The plea of the National Production Authority for scrap to keep the iron and steel industry going at capacity is bearing results, but the need is described as still serious. Railroads, themselves largely dependent upon steel, are lucrative sources of scrap and have recently contributed a total of 336 retired locomotives, netting 6553 tons of metal. Of these, the Pennsylvania Railroad provided 71, the Louisville & Nashville 70, the Delaware & Hudson 62, and the Baltimore & Ohio 56, with 26 other lines turning in the remainder. Virtually all these venerable steam haulage units have been replaced by diesels.

* * *

Chinese Turn to Machinery

Because they are so numerous and have been paid so little for their work, the Chinese have long been considered the antithesis of mechanization. Coolie labor signifies cheap labor. It is significant, therefore, that even the Chinese are turning to mechanical equipment to produce tin in Malaya. The Hong Fatt Mine there is Chinese owned, and with few exceptions its staff and working force are Chinese. Hong Fatt is thought to be the largest open-pit tin mine in existence. Now a bowl-like depression, it covers 125 acres and is 360 feet deep. When it was recovered from the Japanese following the war it was almost filled with water, and it took three years of continuous pumping to empty it.

Now it is being fitted out for large-scale mining. The ore is taken out in benches, each of which is provided with rails. Power shovels will load the cars, which will be drawn by diesel locomotives to a 30-inch conveyor belt that runs up the 1 in 4 slope a distance of 1800 feet. It moves at a speed of 300 feet per minute and can carry 60 tons an hour. Despite the traditionally low wages paid Chinese miners, substantial savings are expected from mechanization and the labor force will, of course, be considerably reduced.

* * *

Aerial Haulage for Dam

It is not unusual for dam builders to transport concrete aggregates by belt conveyors, but a 10-mile aerial tramway across the 9000-foot Cascade Mountains in British Columbia to take in supplies for a dam is a new wrinkle in the construction world. Part of a huge building program proposed by the Aluminum Company of Canada, it has been suggested that the tram could be used during slack times to bring out logs, and for that reason the provincial department of lands and forests is assisting in the studies. Some of the logs would be used in a new pulp mill which it is planned to operate with surplus power from the Aluminum Company's hydro developments.

* * *

Marine Mineral Magnets

Glauconite, a greenish, granular iron mineral similar to the taconites of the Lake Superior ranges, is being deposited slowly on the sea bottom at depths of from 600 to 5000 feet, according to *Steel Facts*, published by the American Iron and Steel Institute. It is formed when the skeletons of shellfish become filled with a fine mud that contains iron leached from rocks on land. Following the death of the shellfish, the sulphates in sea water react with the flesh to produce iron sulphide which, with the addition of dissolved oxygen, becomes ferric hydroxide. Further reaction with silicon and potassium in the water forms the glauconite. It is thought that bacteria play an important part in the process.

Organic iron resulting from animal or plant action is also present in sea water. The original inorganic material leached from rocks is removed from solution by plankton—primitive plants and animals, usually minute, often found in colonies. They are basic food for fishes and marine creates in whose bodies may be high concentrations of many elements. Lobsters, for example, concentrate cobalt; oysters, copper; scallops, nickel; sea slugs and the sea squirt or simple ascidian, vanadium; while mussels and plankton concentrate manganese. The concentrations are too low, however, to give promise of commercial importance. Certain marine plants concentrate boron and molybdenum, while aluminum, selenium, titanium and tungsten remain largely undissolved in the water. Manganese has been deposited in thick layers on the ocean floor, but its origin is not known. More frequently, manganese has been found in rough, round nodules or balls about the size of a walnut. They are nearly pure manganese dioxide and invariably formed around a nucleus of pebbles or of small skeletal bones.

* * *

Fill from Afar

At the entrance to Gowanus Bay, in Brooklyn, N.Y., is the Erie Basin, partially enclosed and protected by an earth-and-rock fill that has a history. The narrow 4000-foot strip, now valued in the millions, cost its originator practically nothing. He was William Beard, an Ulster Irishman, whose name is still identified with the basin. In 1843 he bought from George Hall, the first mayor of Brooklyn, more than 300 acres of the Red Hook shore area, where there was an elbow-shaped bar of sand that was uncovered at low tide. That he sought to build up into a breakwater behind which vessels could anchor in calm water.

The material at hand proved to be but a fraction of what was required, but Beard found a way to get more without cost. Many of the ships that came into New York Harbor then had no cargo and carried sand, soil, rocks, or other heavy materials to give them stability. To save them the expense of disposing of the ballast, Beard invited the skippers to dump it on his property, and they were quick to accept. As a result, the breakwater contains stone and sediment from England, France, Italy, Scandinavia and other maritime nations and is known as the "international fill."

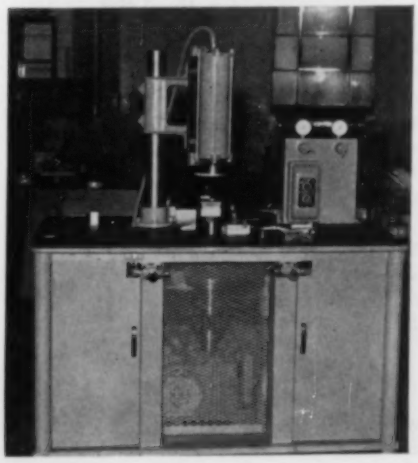
Prior to acquiring this seafront acreage, Beard worked as a general contractor. Among other structures, he built the Long Island Railroad tunnel from Atlantic Avenue to Flatbush in Brooklyn. Later abandoned, the bore was used by bootleggers during the prohibition era to store illicit liquor.

Of Beard's original holdings, 105 acres remain in possession of his descendants. The basin, which got its name because it was long a receiving point for grain shipments through the Erie Canal, now has room for five deep-draft vessels, together with large storage structures and paved areas for the movement of trucks. It is one of the few properties in the country that have been owned and operated by members of the same family for more than 100 years.

Industrial Notes

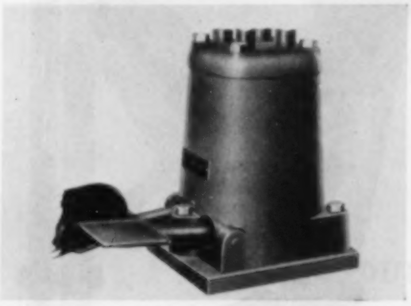
Gloves made of a special plastic mixture by Plasticote Glove Company are intended for workers around heat and flame, acids, chemicals, hot corrosives, and the like. Called Black Magic Gloves, they are said to remain soft and plastic under continual immersion in gasoline, kerosene and xylene, to be unaffected by strong acids and alkalies, to withstand a solution containing as much as 40 percent ferric chloride, and to be highly resistant to abrasion.

Shallow- and deep-drawn shells of varying shapes and sizes are trimmed in one operating cycle by a machine designed by Dayton Rogers Manufacturing Company. The unit can be used for either short runs or mass production and requires little tooling for ordinary work. Two cutters are needed: an external knife that is a part of the trimmer and a combination profile-and-internal knife that has to be provided in accordance with the dimensions of the shells handled. Each is placed bottomside up on the mandrel cutter mounted on a drive spindle and is held in position by a vertical air cylinder. The external cutter is actuated by another air cylinder whose piston rod terminates in a rack that meshes with a sector gear to move the knife up to the spindle. Proper clearance between the two cutters is maintained by an adjustable device on the outer one. Both cylinders are hand controlled and take air from a shop line at from 20 to 80 psi pressure. Trimmer speeds are variable from 5 to 42 rpm, depending upon the size and shape of the work. As a shell rotates, it is trimmed with a clean, flat edge with little or no burr and is ejected from the mandrel by a blast of compressed air. Designated as Model 2A, the machine trims square or rectangular shells of any material up to 0.093 inch in thickness and with corner radii as small as ⅛ inch, work for which it was primarily designed. However, it is also suitable for round and irregular shapes and can be adapted for trimming flanged shells and for such operations as forming, beading, and knurling. Actual production is said to range from 120 large rectangular shells an hour to 600 small round shells.



Hard safety hats such as construction and underground workers and quarrymen wear are molded by E.D. Bullard Company of Fiberglas in rainbow hues. It's not for the sake of appearance, but to permit a company to issue headgear to its men that harmonize with its color scheme, or to identify at a glance the kind of job a worker is doing by the color of his hat.

C. B. Hunt & Son, Inc., has announced a series of foot-operated air valves that features working parts fully enclosed against the entrance of dust and dirt. The housing is made of cast iron and the valving mechanism has a stainless-steel body and push-pull rods, brass sleeves, self-sealing U-shaped packers, and other refinements found in Quick-As-Wink valves. There is no metal to metal seating, and all parts are in pressure balance to eliminate creeping. Available with one or two pedals, the units are designed for air up to 150 psi and a maximum temperature of 150°F. The series includes 3- and 4-way, neutral-position, and regular-action valves ranging in size from ⅜ to 1 inch.



For nut-running and removal in the fields of bus, truck, and industrial maintenance, Ingersoll-Rand Company recommends its new heavy-duty electric Impactool that is based on the same principle as earlier models of this type. The 34U, as it is designated, is rated for bolts up to 1¼ inches in size and has a specially designed cool-running universal motor that is mounted alongside the Impact unit in a one-piece housing to reduce the overall height for close-quarter work. Including protective skid runners on the bottom, which permit sliding it around, the tool is $10\frac{3}{16}$ inches high, 4¾ inches wide, and 14⅛ inches long, exclusive of a ribbed grip handle that may be attached in any one of three positions or eliminated if not required for ease of handling. The regular handle with a trigger-type reversing switch can be rotated 180°. The impact mechanism automatically converts the energy of the electric motor into hundreds of rotary blows per minute, permits the motor to run continuously even when the spindle is stalled, and provides full power in either direction. It is claimed that the 34U transmits no kick or twist to the operator and that it will handle the two toughest truck and bus jobs—spring U-bolt and Budd wheel work—with facility, as well as remove tightly rusted or frozen nuts. Packed in a sturdy box, it comes with a plug and cable. A complete line of nearly 100 different power sockets with accessories is available.

CONFINED SPACE NO BARRIER

Low over-all height and an extra removable grip handle that gives the operator a good hold on the Size 34U Impactool enable him to run up nuts in awkward places such as this without jacking up the truck. Note one of the two skid runners on the bottom that permit sliding the tool around with ease.

Paint Corporation of America has announced a new paint suitable for indoor and outdoor use that is said to protect new metal from rust and to stop the corrosive action on metals that have already been attacked. Applied right over the rust without extensive surface preparation, it penetrates to the base metal and seals the surface against further corrosion. PCA-100, as it is designated, is furnished in black only and can be applied by brush or air spray. There is a clear solution, PCA-101, for use where a colored finish coat is desired.

High speed without vibration are essentials in a tool used for drilling very small holes, and these characteristics are combined, it is claimed, in a machine developed by Toolmakers & Designs, Ltd., of Coventry, England. The tool is of the inverted type and has been named Capillary Drill. The drilling head is on the base plate of the machine and the work-holding fixture is supported by a column fastened to the plate. Both are adjustable, the former longitudinally

VICTAULIC...
The Best Method for Piping!

A METHOD with plenty of meaning, that's Victaulic . . . it's the world's best. The Victaulic name stands for pioneering and leadership in quick, dependable piping . . . the Victaulic Method stands for quicker, money-saving piping construction.

Here's what the VICTAULIC METHOD *is* and why it's the EASIEST WAY TO MAKE ENDS MEET . . .

- A complete line of simplified, versatile pipe couplings ¾" through 60" sizes for steel, spiral and cast iron pipe . . . that automatically provide flexibility for irregular laying contours and yet assure positive-lock, leak-proof joints even under extreme pressure, vacuum or strain conditions.
- A complete line of modern Full-Flow Elbows, Tees and other Fittings that provide for directional changes, branch lines and all of the other essentials of a piping system.
- Handy, portable Vic-Groover Tools that prepare the pipe twice as fast and with half the effort of conventional pipe threader.

On your next piping job — new construction, repairs, or alterations — try the Victaulic Method and you'll be sure to save time, work, and money.

Make that next piping job ALL VICTAULIC! Write today for Victaulic Catalog and Engineering Manual No. 44-8B

NOTE VIC'S NEW COMBINED MAIN OFFICE AND PLANT ADDRESS BELOW—

"VIC"
VICTAULIC
Sizes—¾"
through 60"
VICTAULIC

VICTAULIC COMPANY OF AMERICA
1100 Morris Avenue, Union, N. J.
Mailing Address: Box 509, Elizabeth, N. J.
Phone: Elizabeth 4-2141
Victaulic Inc., 727 W. 7th St., Los Angeles 14, Calif.
Victaulic Company of Canada, Ltd., 406 Hopewell Ave., Toronto 10
For Export outside U.S. & Canada: PIPECO Couplings & Fittings,
Pipe Couplings, Inc., 30 Rockefeller Plaza, New York 20, N.Y.

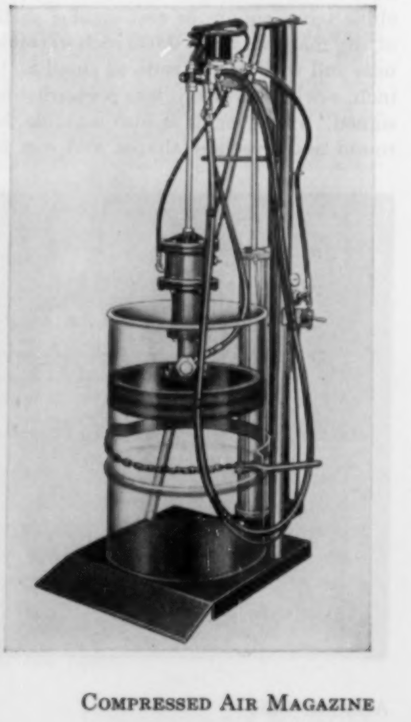
27TH VICTAULIC YEAR

The easiest way to make ends meet
VICTAULIC
PIPE COUPLINGS AND FITTINGS

Copyright 1951, by Victaulic Co. of America

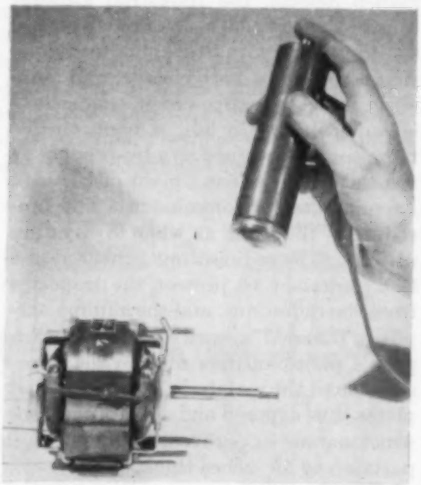
along a dovetailed guide and the other vertically in a slot in the column. The drill spindle is air driven at a speed of approximately 28,000 rpm and is mounted on precision ball bearings through which it passes freely, as well as through the rotor, to provide vertical feed to the drill. Compressed air is supplied by a hose connection near the top of the drill-head housing and passes through ports to the rotor, from which it is exhausted through a series of holes that direct it towards the drill and the workpiece. By this arrangement the air serves not only to drive the spindle but also as a cooling medium and to blow away the swarf. An oiler in the air line lubricates the drill, which has an over-all height of about 17 inches.

For the delivery of lubricants and mastics that do not readily seek their own level, the Lincoln Engineering Company has introduced a pressure primer for use with its heavy-duty forced-induction drum pumps. The unit consists essentially of a single-post hydraulically actuated air ram and elevator and of a follower assembly with a double-edged sealing member that fits snugly inside standard 55-gallon containers. The pump with its superimposed air motor is inserted and locked in the follower, which is forced down upon the material through the action of the air ram. The latter also serves to lift and lower the pumping unit and to hold it in any desired position. The ram is controlled by a 3-way valve, and when operated with air at 100 psi exerts a pressure of 7110 pounds against the free surface of the compound, completely emptying and cleaning the sides of the drum, it is claimed. A vent automatically breaks the hold of the follower seal when the elevator is raised. The top of the latter and the air motor are con-



nected by an adjustable stud. Air is admitted to the pumping unit by means of a solenoid valve actuated by a microswitch on the valve that regulates the flow from the drum, thus allowing the pump to function only when material is being delivered. Complete with air-operated pump, the unit is called Piledriver.

A portable stroboscope for production and laboratory testing as well as field servicing motors, time switches, business machines, and numerous other devices using synchronous speeds has been announced by the Synchroscope Company. The instrument is operated like a flashlight by a button switch and is said to indicate synchronous speeds with extreme accuracy. It has a cold cathode Triode tube that rectifies the line source and instantaneously gives off a pulse of light for instant reading only during the positive phase of the alternating-current cycle. The visual pulse per cycle stroboscopically stops the motion of a motor or machine that is operating in synchronism with the line frequency. The instrument has a diameter of 1½ inches, is 5 inches long, and weighs less than five ounces.



Among the exhibits at the British Industries Fair is a pneumatic cleaner for condenser tubes, etc. In place of the lances ordinarily used for the purpose, The Kleen-e-zee Brush Company, Ltd., has developed a compressed-air gun and a "bullet"—a radial brush made of stiff metal wire and having a washer at each end. With the bullet in position, the gun is pressed against it and a charge of compressed air is released, a pressure of 70 psi normally being sufficient to propel the brush through the tube. It is claimed that a condenser can be cleaned in this manner in far less time than by the older method.

Concrete of varying thicknesses in dams and other structures, roadways, etc., can be tested for hidden cracks and

For Safety and Long Service ...the *Improved* Walco

HEAVY DUTY PIPE WRENCH

Safety? Yes, indeed, Walworth, with more years of adjustable pipe wrench manufacturing experience than any other manufacturer, builds safety into the *Improved* Walco Heavy Duty Pipe Wrench. All parts are forged from the finest high carbon steel, heat treated to add extra strength. The jaws of the *Improved* Walco are carefully machined and hardened, affording a quick, sure grip. The handle and housing is made an integral unit by projection welding, taking advantage of projection welding's inherent strength to make the *Improved* Walco strong . . . and safe! Because the *Improved* Walco is all forged steel, it will withstand tremendous bending strains and bend—not break—when overloaded.

When you buy an *Improved* Walco Heavy Duty Adjustable Pipe Wrench safety is only one of the plus factors you get. There are many others—light weight—quick ratchet action—renewable lower jaw—calibrated pipe scale—perfect balance—and long years of satisfactory service.

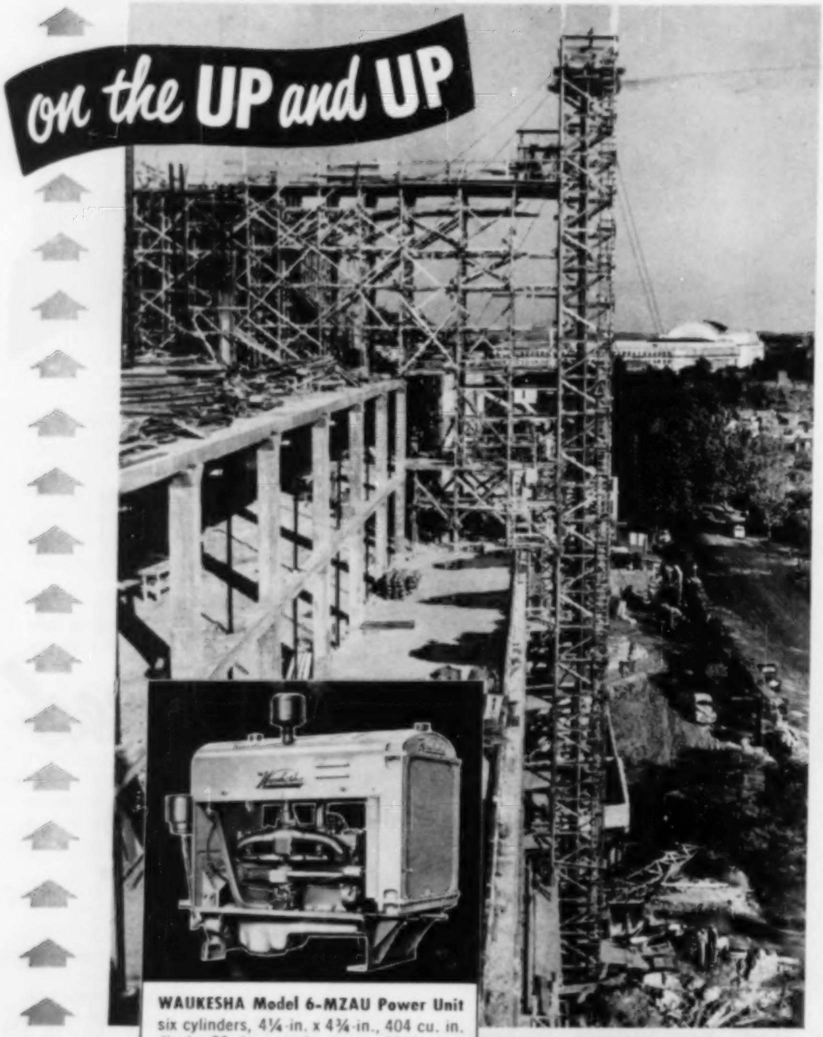
Ask your Walworth Distributor to show you this new heavy duty pipe wrench. See it, heft it, and you'll want to own it.

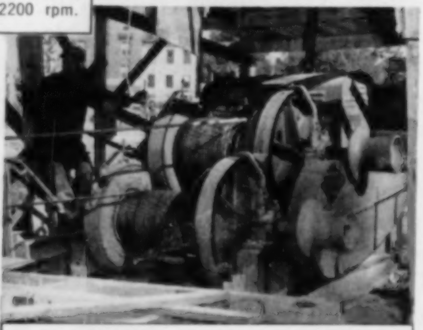
WALWORTH

valves • fittings • pipe wrenches

60 EAST 42nd STREET, NEW YORK 17, N. Y.

DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD





WAUKESHA Model 6-MZAU Power Unit
six cylinders, 4¼-in. x 4¾-in., 404 cu. in. displ., 86 hp. maximum at 2200 rpm.

THE OPERATOR SAYS: *"the best I've ever operated in 35 years of experience."*

WAUKESHA POWER
GIVES EVERYTHING A LIFT!

111

● Operating the tower—in the construction of the Government Accounting Building, Washington, D. C. (John McShain, Inc., general contractor)—is a Clyde No. 7268 Hoist with a 10,000 linepull at 200 fpm powered by a 6-MZAU Waukesha Unit. And that accounts for the steady, safe and sure lifting of all the materials on the job with no down time and no delays. Waukesha builds in smooth dependable power with 7-bearing crankshaft, high turbulence combustion chamber, blue flame manifold, full pressure oiling, thermostat and by-pass for quick warm-up, other "top drawer" features. Get Bulletin 1270.

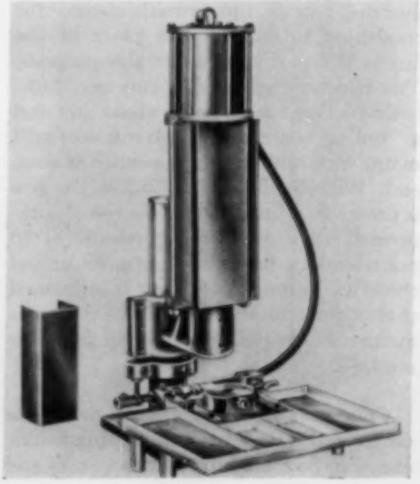
WAUKESHA MOTOR COMPANY, WAUKESHA, WIS., NEW YORK, TULSA, LOS ANGELES

WAUKESHA

strength by an external method developed by the Hydro Electric Power Commission of Ontario, Canada, and built for general use by the McPhar Engineering Company. Called Soniscope, the instrument is made up of a transmitter and a receiver connected by cables with a central control unit that measures the time it takes to send an ultrasonic wave through the concrete. With the time and the thickness of the concrete known factors, it is a simple matter to compute the speed of the wave, which indicates the soundness of the material. The greater the number of imperfections the slower the movement of the wave.

Instead of the conventional X-ray method of inspecting thick castings for hidden defects, the Industrial Laboratories Corporation, of Los Angeles, Calif., is using a radiographic technique that is said to be both cheaper and more effective. The source of the emanations is radiocobalt (Co 60), a nonexplosive radioisotope obtained as a by-product at the Oak Ridge, Tenn., plant of the U.S. Atomic Energy Commission. The procedure is the same as when X-rays are utilized. The radioisotope is housed in a lead container to protect the inspector from the radiations, and the gamma output is directed toward the work to expose a photosensitive film on the opposite side of the metal. It is reported that plates thus exposed and developed in the usual manner have revealed flaws in steel parts up to 15 inches thick.

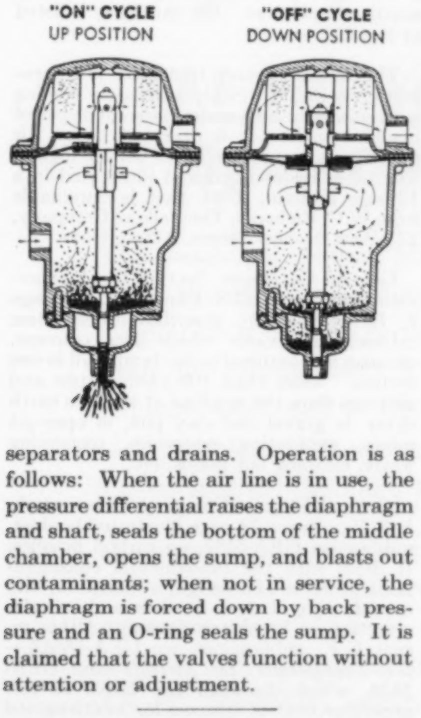
Light staking, forming, riveting, punching, and similar operations are performed by an improved pneumatic bench-type press recently announced by Winter Products, Inc. Designated as Model RR-6A, the machine is rated to deliver as many as 60 spring-powered blows per minute with variable impacts up to 12,000 psi, or a squeeze up to twelve times the air-line pressure. It is said to permit delicate operations such as marking because there is no rebound to mar the work. Throat is 10x4½ inches



in size and stroke is adjustable from 1 to 2 inches. Two-hand control insures safe manual feed. Use of a foot-operated air-powered slide feed and work ejector is optional. The picture shows the press equipped with the slide feed and with a small-parts tray.

Saving in weight is one advantage claimed for a new bimetal that has been developed in the Allied Zone of Germany. Named Cupal, the basic material is aluminum with a layer of copper welded to it on one or both sides by a special process. The metal is rolled to the desired thickness. It is scheduled for production in the United States.

A new line of valves for the automatic removal of contaminants and precipitates from compressed-air lines, aftercoolers, sumps, tanks, and air-brake systems has been announced by Wilkerson Corporation. As the accompanying cross-sectional drawings show, the units are of the diaphragm type with built-in separators and drains. Operation is as follows: When the air line is in use, the pressure differential raises the diaphragm and shaft, seals the bottom of the middle chamber, opens the sump, and blasts out contaminants; when not in service, the diaphragm is forced down by back pressure and an O-ring seals the sump. It is claimed that the valves function without attention or adjustment.

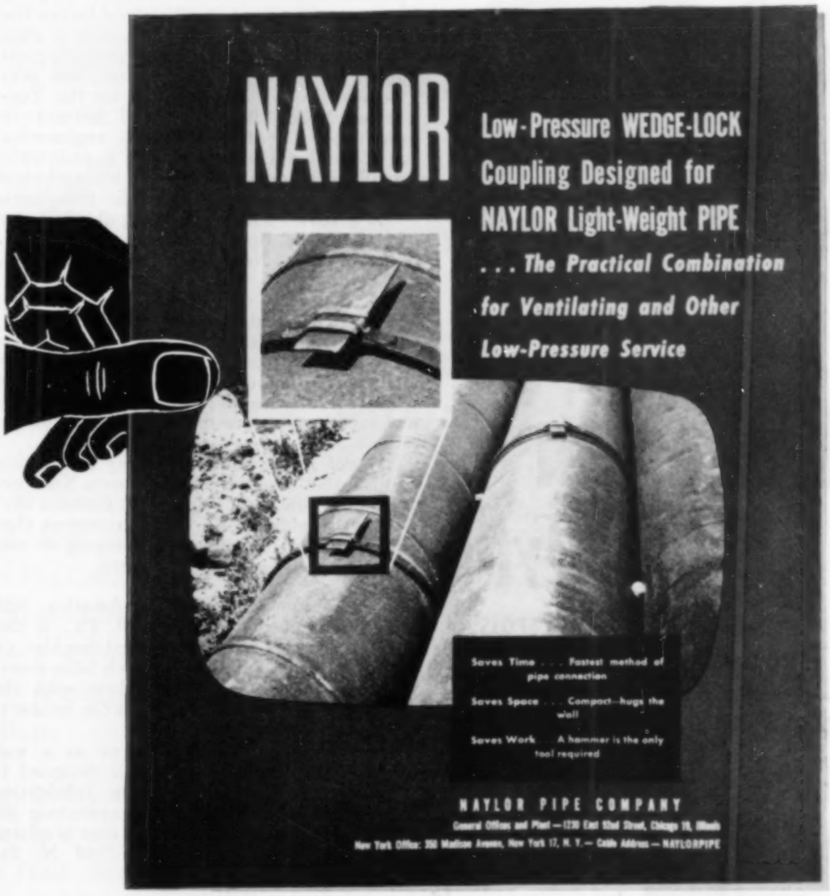


Metal fabricators have at their disposal a new tool that is designed to countersink holes from 5/16 to 5/8 inch in diameter in all kinds of sheet metal up to 1¼ inches thick. Called Airmatic Countersink, it is made by the Cleco Division of the Reed Roller Bit Company and has a built-in micrometer and lubricator. Mandrels for varying hole diameters and countersinks can be changed without dismantling the tool, which has two controls: one for clamping it to the work and the other for rotation. It is operated with air at 80-120 psig and is said to countersink a 3/8-inch hole in 75-ST aluminum in nine seconds. Countersink is of the standard bayonet type.

HERE'S THE EASIEST WAY

TO CONNECT NAYLOR PIPE

IN LOW-PRESSURE SERVICE



NAYLOR

Low-Pressure WEDGE-LOCK Coupling Designed for NAYLOR Light-Weight PIPE

. . . The Practical Combination for Ventilating and Other Low-Pressure Service

Saves Time . . . Fastest method of pipe connection

Saves Space . . . Compact—hugs the wall

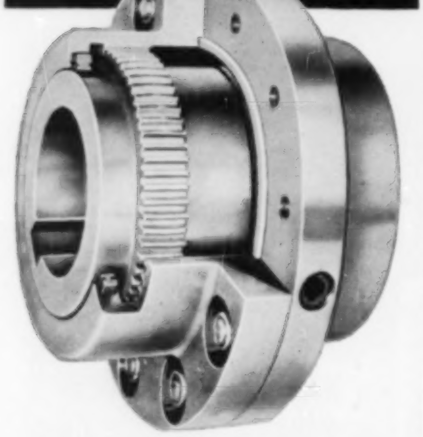
Saves Work . . . A hammer is the only tool required

NAYLOR PIPE COMPANY
General Offices and Plant—1230 East 92nd Street, Chicago 19, Illinois
New York Office: 350 Madison Avenue, New York 17, N. Y.—Cable Address—NAYLORPIPE

Send for this new Bulletin No. 514 on the Naylor Low-Pressure Wedge-Lock Coupling. See how quickly and easily ventilating and other low-pressure or temporary lines can be made up with this practical coupling medium and no other tool but a hammer. Coupling sizes for light-weight pipe from 8" to 30" in diameter. Write today for your copy.

NAYLOR PIPE COMPANY
1245 East 92nd Street, Chicago 19, Illinois
New York Office: 350 Madison Avenue, New York 17, N. Y.

INSURE
trouble-free
COUPLING
SERVICE



WALDRON
Gear Type

ELIMINATES THE TROUBLE SPOTS
OF ORDINARY COUPLING DESIGNS

Solid Cover Sleeve Non-Welded
No danger of distorting accurate gear in sleeve.

No Metal-To-Metal Wear
to cause leakage and expensive repairs.

Hermetically Sealed
to protect lubricant from exposure to air and dust.

For details on other construction features, ratings, service factors, etc., write for catalog.

JOHN WALDRON
CORPORATION
NEW BRUNSWICK, N. J.
Agents in Principal Cities

Books and Industrial Literature

Hydraulic Transients by George R. Rich is a valuable reference tool for engineers interested in hydraulic and hydroelectric design. The author deals with a wide variety of practical problems in hydraulic transients but concerns himself primarily with the application of arithmetic integration and trial-and-error arithmetic solutions of those problems. In the 255 pages of the book are chapters devoted to full discussions and solutions of typical problems in water hammer, turbine speed regulation, stability of governing, water-hammer pressures in pump discharge lines, the differential surge tank and the restricted-orifice surge tank, navigation locks and surges in power canals—tidal harmonics. A final chapter gives the elements of the graphical method of water-hammer analysis for purposes of coordination and brings the reader abreast of the developments in that field. George R. Rich, now consulting engineer to Charles T. Main, Inc., was previously chief design engineer for the Tennessee Valley Authority and lecturer to graduate students in hydraulic engineering at Columbia University. He is eminently qualified to deal with the highly technical problems involved in hydraulic transients. *Hydraulic Transients* is published by McGraw-Hill Book Company, Inc., 330 W. 42nd Street, New York 18, N.Y. Price, $6.00.

F.T. Griswold Manufacturing Company, 305 W. Lancaster Avenue, Wayne, Pa., has available a 4-page folder devoted to its OPL metallograph, a compact instrument for examining and photographing samples of metal and other materials.

Metal Identification Marking is the title of a leaflet issued by The Roberts Numbering Machine Company, 700 Jamaica Avenue, Brooklyn 8, N.Y., for concerns that have a need for means of stamping or embossing metal machines or parts.

Aluminum Company of America, 680 Gulf Building, Pittsburgh 19, Pa., is distributing a 14-page illustrated booklet on its East St. Louis, Ill., research laboratory. It tells of the work done there with the many products the firm makes for industry.

A broadside that will serve as a wall chart when opened up and is designed to assist in selecting adequate lubrication equipment to gain the full operating life from machinery at minimum cost is offered by Trico Mfg. Company, 2948 N. 5th Street, Milwaukee 12, Wis.

A bulletin intended to aid in the selection of meters for measuring more than 200 liquids with varying corrosive characteristics is obtainable from Rockwell Manufacturing Company, 400 North Lexington Avenue, Pittsburgh 8, Pa. It is designated as No. 0G400.

How Safe Are Your Drawings? is the title of a handbook issued by Remington Rand Inc., 315 Fourth Avenue, New York, N.Y. It describes equipment to protect tracings, drawings, and specifications from fire and points out that so-called "fireproof" buildings often do not afford ample protection.

The City of Detroit, Mich., is prepared to handle five million gpm of storm water with centrifugal pumps and newly constructed relief sewers. The story of this outstanding example of the application of large a-c synchronous motors to centrifugal pumps is told by George R. Thompson, City Engineer for the City of Detroit, in E-M Synchronizer No. 33 published by the Electric Machinery Mfg. Company, Minneapolis 13, Minn. The 2-color, 24-page booklet contains much additional information on the application of a-c motors to pumping problems.

New and old facts about belting, all designed to give the user of belts greater service and satisfaction, have been brought together in a 16-page booklet offered by E.F. Houghton & Company, 303 W. Lehigh Ave., Philadelphia 33, Pa. It bears the title, *Houghton's Treaded Leather Belting.*

Rubatex, a rubber compound of individually sealed cells filled with inert nitrogen gas under pressure, is the subject of a catalogue published by Great American Industries, Inc., Bedford, Va. Included is a sample panel containing twelve miniature specimens of Rubatex to show variations in density and color.

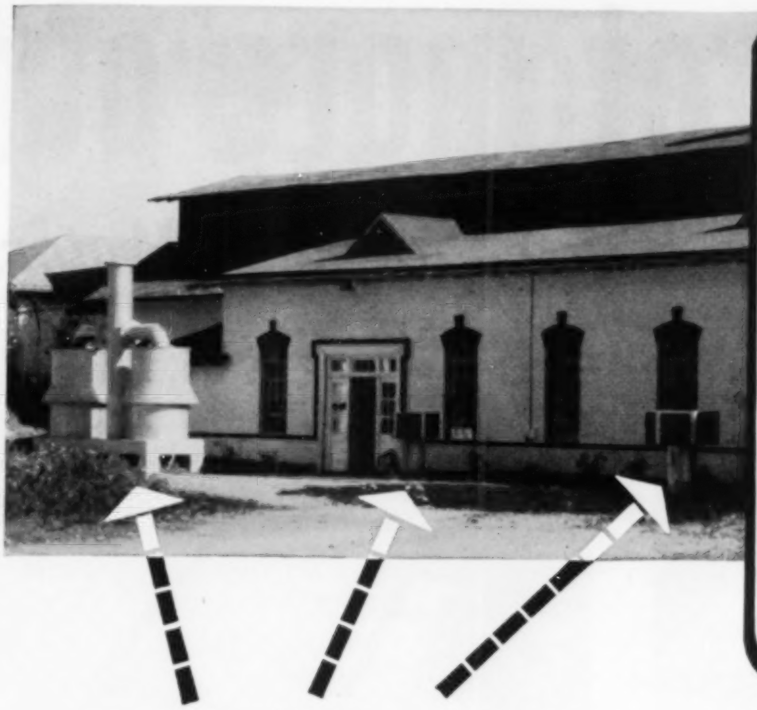
Bausch & Lomb Optical Company, Rochester 2, N.Y., claims that it has devised a "different" kind of catalogue to describe its new Balphot Metallograph. Since the machine for studying metal structures is too big to be carried around and demonstrated, it has been portrayed in great detail by words and pictures. The catalogue is listed as No. 232.

The Bellows rotary feed table is a pneumatic device for quickly and safely feeding work pieces to and under different types of machine tools. It is operated by an air cylinder at a pressure of 15 psi or higher. The table is described and illustrated in a 12-page bulletin, T-80, that is obtainable from W.C. Richards, The Bellows Company, 222 West Market Street, Akron, Ohio.

General Catalogue, Section C, of Sauerman Bros, Inc., 522 S. Clinton St., Chicago 7, Ill., graphically describes its slackline cableway excavator which digs, conveys, elevates and automatically dumps, all in one motion. More than 100 photographs and sketches show the machine at work on earth dams, in gravel and clay pits, in open-pit mines, excavating reservoirs, reclaiming waste, cleaning out ponds, etc.

General Electric Company, Schenectady 5, N.Y., offers a 28-page illustrated booklet, publication GEA-5597, on carbon brushes. It deals with the fundamental considerations given to the design, application, and manufacture of these brushes, and includes a section on brush terminology. Other recent G.E. publications are GEA-4866A—*G-E Transformers for Aircraft*—and GEA-5628, which discusses the firm's 28-volt generator control systems for multiengined aircraft.

Three-quarters of a grain of dust per 100 cubic feet of gas can now be measured by instruments developed by the U.S. Bureau of Mines as a result of investigations conducted by the bureau when it found that the slightest traces of dust in large volumes of gas being compressed into synthetic liquid fuels can destroy the compression machinery in a few minutes. Information on this important work is published in Bureau of Mines Report 4782—*Investigation of a Photoelectric Device for the Determination of Low Concentrations of Dust*—by D. I. Stone, L.J. Kane, T.E. Corrigan, H.W. Wainwright and C.B. Seibert. A limited number of copies are available and can be obtained without charge from the Publications Distribution Section, Bureau of Mines, 4800 Forbes Street, Pittsburgh 13, Pa.



CLEAN AIR HELPS PAY for 400-Acre PARK

AAF Filters Contribute to High Profit Operation of Kansas Power Plant

The municipal power plant of Garnett, Kan., serves a community of only 2500 people, yet it netted a profit of $141,962.00 from 1945 through 1949. A portion of these earnings were used to develop a 400-acre park complete with swimming pool, golf course, football field and stadium.

The secret of this success story—low maintenance costs in which filtered air played an important role. Three of the four diesel engines are equipped with AAF Type "OC-H" washable, unit-type filters—the fourth and newest engine with a duplex Cycoil Oil Bath Air Cleaner. The oldest engine dating back to 1925 was only recently rebuilt and is now operating 2000 hours yearly. Another engine installed in 1930 has run more than 70,000 hours and still retains its original pistons and cylinder liners.

Here's convincing proof that clean air can pay a handsome profit—of AAF filters' ability to deliver continuous high-efficiency cleaning service. There's an AAF filter of a type and capacity designed to convert your dust into dollars. Write today for complete product literature.

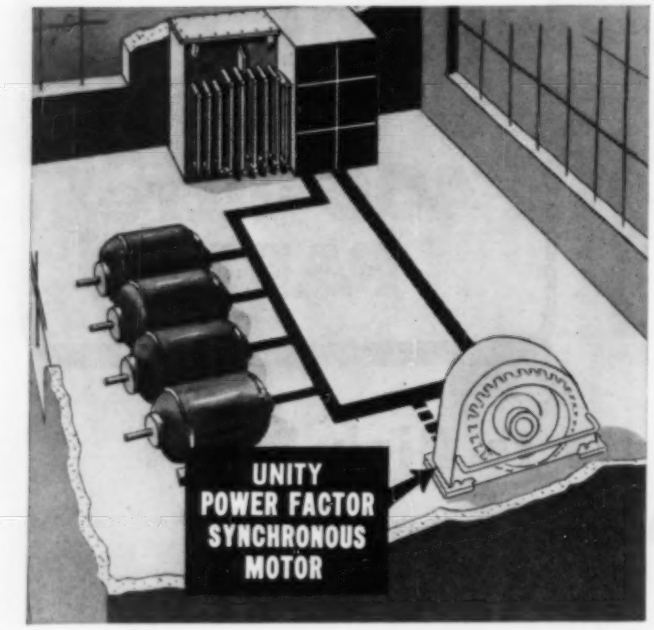
Today's Best Buy is Better Air!

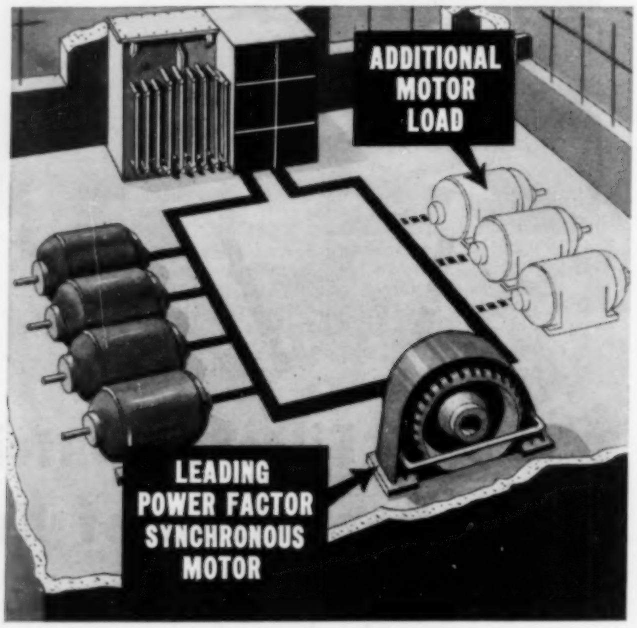
®AAF

American Air Filter
COMPANY, INC.
402 Central Avenue, Louisville 8, Kentucky • Darling Bros., Ltd., Montreal, P. Q.

How to get more out

. . . . *install G-E Synchronous Motors*





If your plant power system is loaded close to full capacity and you have a place where a large constant-speed motor can be used, you may be able to install a *unity power-factor* synchronous motor without increasing the kva load on your system.

Or, if your power system is already overloaded, then a *leading power-factor* synchronous motor can actually supply kvars to your system while performing its usual drive duties. Then you can often install additional inductive apparatus to an existing system without fear of overloading feeder lines.

If you are planning plant expansion or you need more motors and/or suspect power system overloading, contact the nearest G-E sales engineer. He'll help you survey your system, and help you determine the type of synchronous motor you need—should this be one answer to your power system problems. *General Electric Company, Schenectady, N.Y.*

NEW! A Helpful Training Course on Motors!

Everyone concerned with technical training problems will want this new G-E Motor Selection and Application Course. Consists of 9 short, easily understood lessons. Complete kit—slide films, review booklets and instructor's manual—$100. Call or write your nearest G-E sales office, or send for free copy of 96-page instructor's manual.

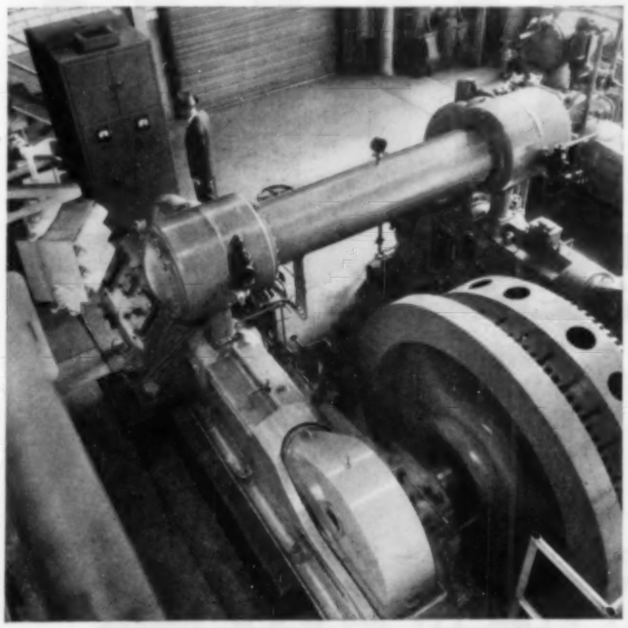
Look at the scope of this Course

1. **Fundamentals of Motors**
2. **Types of Motors**
3. **Fundamentals of Selection**
4. **A-c Induction Motors**
5. **Single-phase Motors**
6. **D-c Motors**
7. **Synchronous Motors**
8. **Adjustable-speed Drives**
9. **Gear Motors**

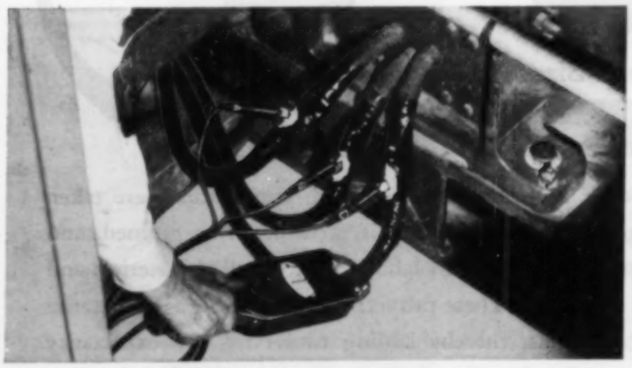
GENERAL ELECTRIC

# of your power system

for unity and leading power-factor drives



Control, too, will protect your system—G-E Limitamp high-voltage control provides ample interrupting capacity, protection for operating personnel, good appearance, and compactness. Here it controls and protects a 350-hp G-E synchronous motor.



Check power factor on individual circuits**—easily, quickly—with new G-E hook-on power-factor meter. This portable instrument hooks around the line—no cutting of conductors, no costly shutdowns to make power checks. You can accurately locate those circuits where corrective action is needed.**

G-E SYNCHRONOUS MOTORS ARE DRIVING . . . .

pumps
compressors
Jordans
beaters
crushers
ball mills
tube mills
large conveyors
blowers

saws
generators
rolling mills
pulp refiners
chippers
flour mills
stock refiners
line shafts
fans . . . .

in all types of industries where their efficiency, low first cost, and reliability make them exceedingly popular.

mail this coupon today

General Electric Co. Sect. E770-25
Schenectady 5, N. Y.

Please send me the following literature. . .

☐ **for reference purposes**
☐ **for planning an immediate project**

( ) GER-234—Synchronous Motors Do Two Jobs at One Time
( ) GEA-5332—Low-speed Synchronous Motors
( ) GEA-5426—High-speed Synchronous Motors
( ) GEA-5469—G-E Testing Instruments
( ) GEZ-310—Motor Training Course Instructor's Manual

Name ....

Company ....

Address ....

City .... **State** ....

STRENGTH

for Safety and Long-Time Service

For 2000, 3000 and 6000 pounds service — Sizes 1/8" to 6"

SCREW END TYPE

For schedules 40, 80 and 160 pipe — Sizes 1/8" to 4"

SOCKET WELD TYPE

Vogt Ells, Tees, Crosses, etc., are forged from carbon steel or various alloys to meet specific operating conditions. Catalog F-9 will aid you in their selection and proper application.

Shocks and stresses imposed by high pressures and high temperatures are taken in their stride because Vogt fittings are uniform in structure, fine grained, and free from porosity . . . the superior product of laboratory controlled materials and giant forging hammers and upsetters. These properties also give higher resistance to erosive and corrosive conditions, thereby adding to service life expectancy in steam plants, petroleum refineries, chemical plants and related industries.

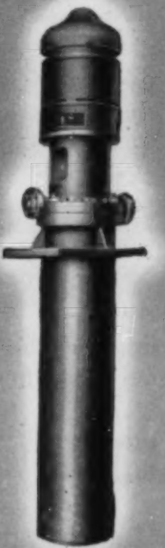
Vogt
FOR BETTER FITTINGS

HENRY VOGT MACHINE CO., INC.
Louisville 10, Kentucky
BRANCH OFFICES: NEW YORK • PHILADELPHIA • CLEVELAND • CHICAGO • DALLAS

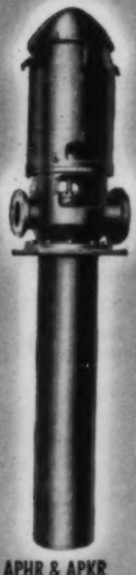
Vogt

DROP FORGED STEEL FITTINGS

CLASS VP
Multi-stage, diffusor type
Capacities—10 to 400 gpm
Pressures—to 170 psi



CLASS VHTB
Multi-stage, diffusor type
Capacities—25 to 125 gpm
Pressures—to 1500 psi



CLASS APHR & APKR
Single- and multi-stage, turbine type
Capacities—60 to 3500 gpm
Pressures—to 600 psi

Why Ingersoll-Rand

VERTICAL PUMPS

are HIGH in performance and LOW in installation and maintenance

OPERATION IS BETTER

These rugged, vertical process pumps have repeatedly proved their dependability and unusually high economy in refineries the world over. The shaft and impeller assembly is in complete radial balance. And positive alignment is maintained by accurate machined fits of all mating sections. The proven design of these units—with each part of the most suitable material for the application—assures *sustained* high efficiency.

INSTALLATION IS EASIER

The in-line arrangement of suction and discharge nozzles permits simple, straight-through piping—without loops or elbows. Piping can be located above or below floor level, as desired. Compact, vertical design conserves space—eliminates the need for large foundations, bedplates and grouting.

MAINTENANCE IS SIMPLIFIED

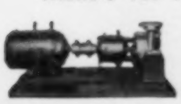
There is only one stuffing box—easily accessible through openings in the discharge head. Either conventional packing or the I-R Cameron Shaft Seal can be used. There is no thrust bearing to maintain, residual thrust being taken by the motor bearing. And the segmented inner casing assembly is easy to dismantle and assemble for inspection or servicing. Maximum interchangeability of impellers and diffusor sections reduces spare parts inventories.

The inherent advantages of vertical design particularly suit these pumps to many refinery and process services. Your nearest Ingersoll-Rand branch office engineer will be glad to study your next pumping problem with you. Whether the solution indicated calls for a vertical or horizontal unit, you are assured of obtaining the *right* pump for the job when you specify Ingersoll-Rand.

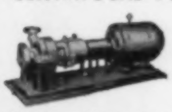
Ingersoll-Rand
CAMERON PUMP DIVISION
11 Broadway, New York 4, N. Y.

588-10

THERE'S AN I-R CENTRIFUGAL PUMP FOR EVERY REFINERY NEED

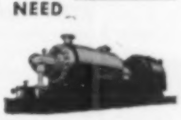


Single-stage, vertically split
Capacities—20 to 550 gpm
Pressures—to 300 psi



Single- and two-stage, vertically split
Capacities—10 to 3000 gpm
Pressures—to 600 psi

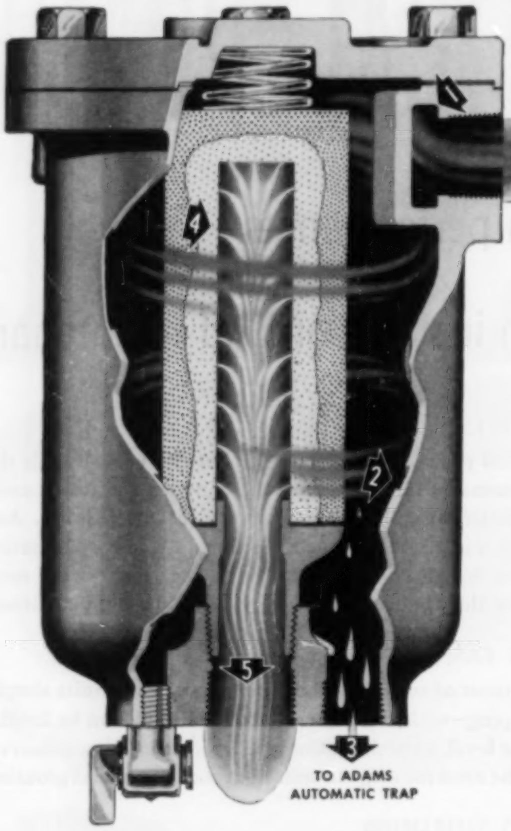
Single- and two-stage, horizontally split
Capacities—20 to 3500 gpm
Pressures—to 500 psi



Multi-stage, with cylindrical "double-case" construction
Capacities—to 2800 gpm
Pressures—to 3000 psi

COMPRESSORS — AIR TOOLS — ROCK DRILLS — TURBO BLOWERS — CONDENSERS — CENTRIFUGAL PUMPS — DIESEL AND GAS ENGINES

ADAMS *has both* *


1
4
2
5
3
TO ADAMS AUTOMATIC TRAP

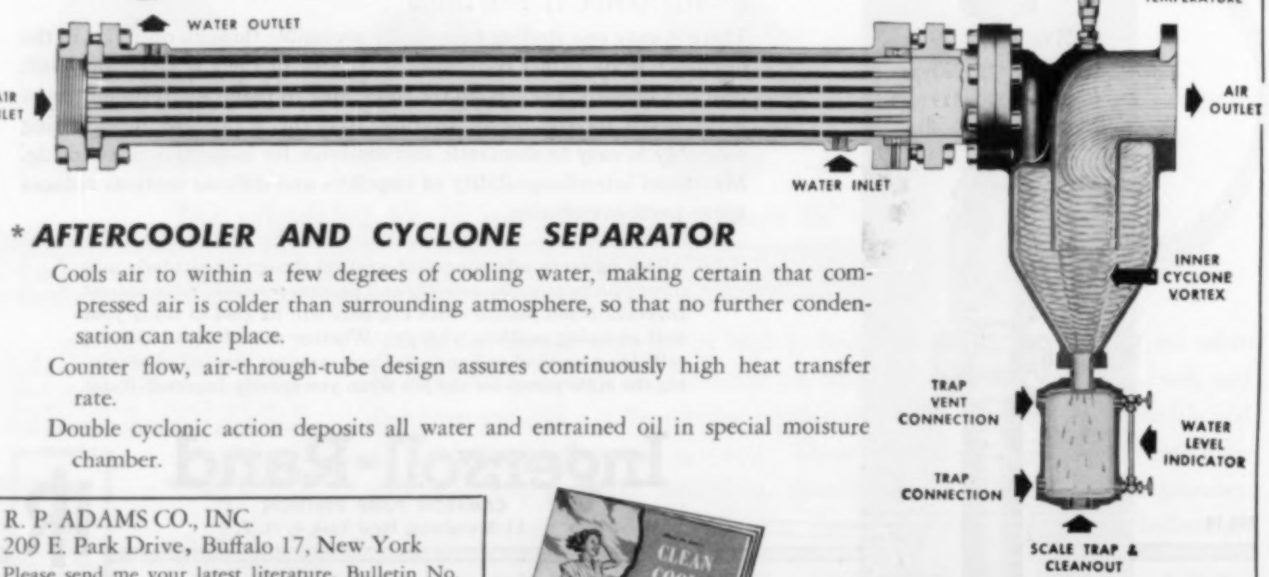
—— BOTH ANSWERS TO THE PROBLEM OF KEEPING WATER, WATER VAPOR, OIL AND DIRT OUT OF COMPRESSED AIR LINES

There's no *one* answer to this problem! The most expensive aftercooler you can buy will not remove scale that is picked up in the distribution lines. The most expensive air filter you can buy cannot guarantee removal of water vapor until it has been condensed by cooling. That's why Adams makes both.

* PORO-STONE *AIR FILTER*

1. Centrifugal separation of dirt and liquids.
2. Drainage to trap directed by vertical cast-in slots.
3. Continuous, fully automatic trap action.
4. Rapid diffusion and filtration through permanent, cleanable Poro-Stone.
5. Clean, dry air at practically unchanged pressure. Standard, stocked sizes handle from 10 to 700 cfm.

Easily installed in either vertical or horizontal pipe line.


THERMOMETER TO INDICATE DISCHARGE AIR TEMPERATURE
WATER OUTLET
AIR INLET
AIR OUTLET
WATER INLET
INNER CYCLONE VORTEX
TRAP VENT CONNECTION
WATER LEVEL INDICATOR
TRAP CONNECTION
SCALE TRAP & CLEANOUT

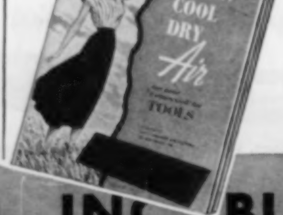
* *AFTERCOOLER AND CYCLONE SEPARATOR*

Cools air to within a few degrees of cooling water, making certain that compressed air is colder than surrounding atmosphere, so that no further condensation can take place.

Counter flow, air-through-tube design assures continuously high heat transfer rate.

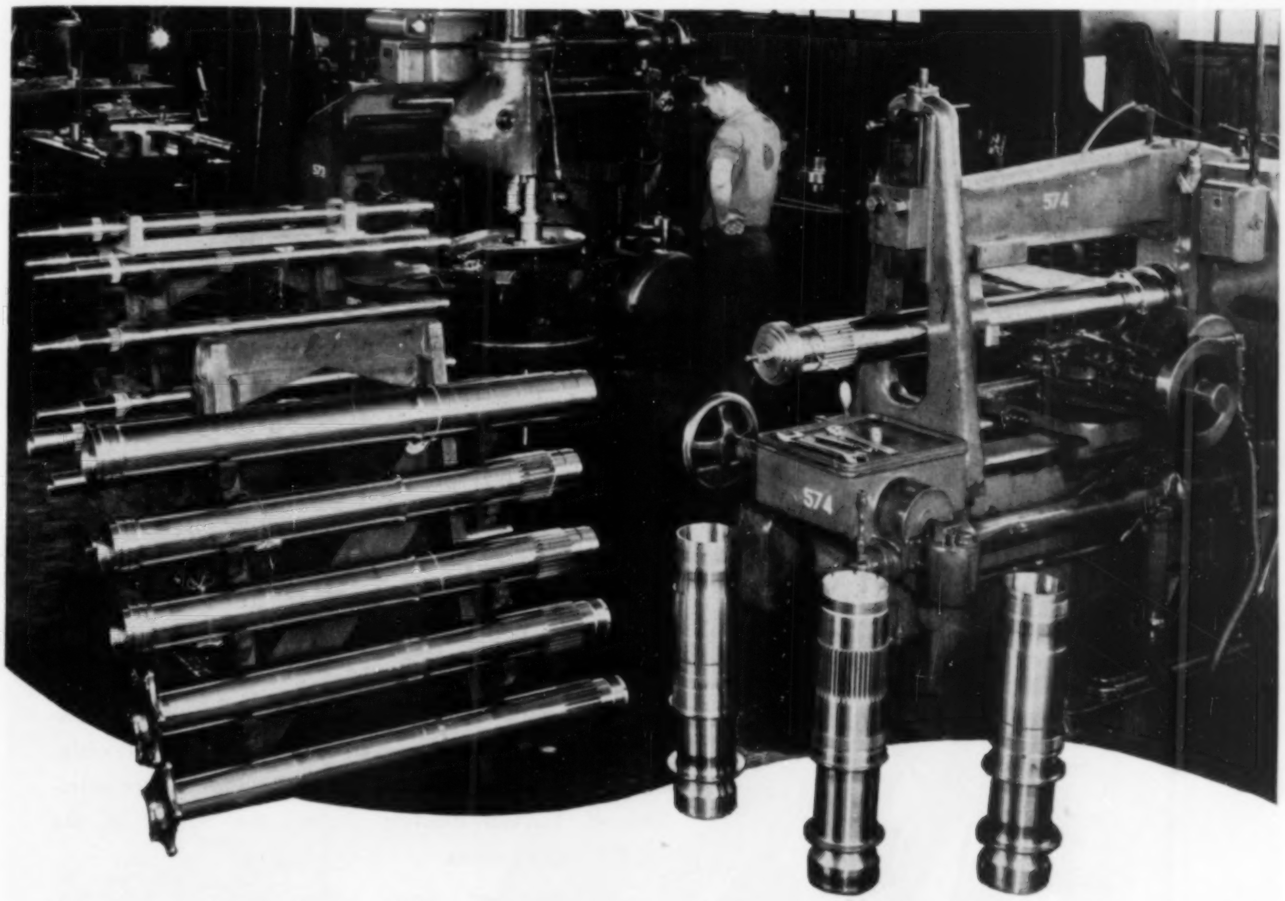
Double cyclonic action deposits all water and entrained oil in special moisture chamber.

R. P. ADAMS CO., INC.
209 E. Park Drive, Buffalo 17, New York
Please send me your latest literature, Bulletin No. 176 on BOTH the Poro-Stone air filter and the Adams Aftercooler — Cyclone Separator.
Name ....
Company .... *Title* ....
Address .... *State* ....


CLEAN
COOL
DRY
Air
TOOLS

FOR YOUR PROFIT'S SAKE
— FIND OUT ABOUT BOTH

R. P. ADAMS CO., INC., BUFFALO 17, N. Y.



ALLOY STEEL FORGINGS
FOR THE AIRCRAFT INDUSTRY

From its early days National Forge has produced alloy forgings, heat treated and machined to the exacting requirements of the Aircraft Industry.

We are proud that our facilities—the special electric steels, heat treating and skilled machining—have made it possible for us to assist the aircraft industry in pioneering the development of many mechanical components.

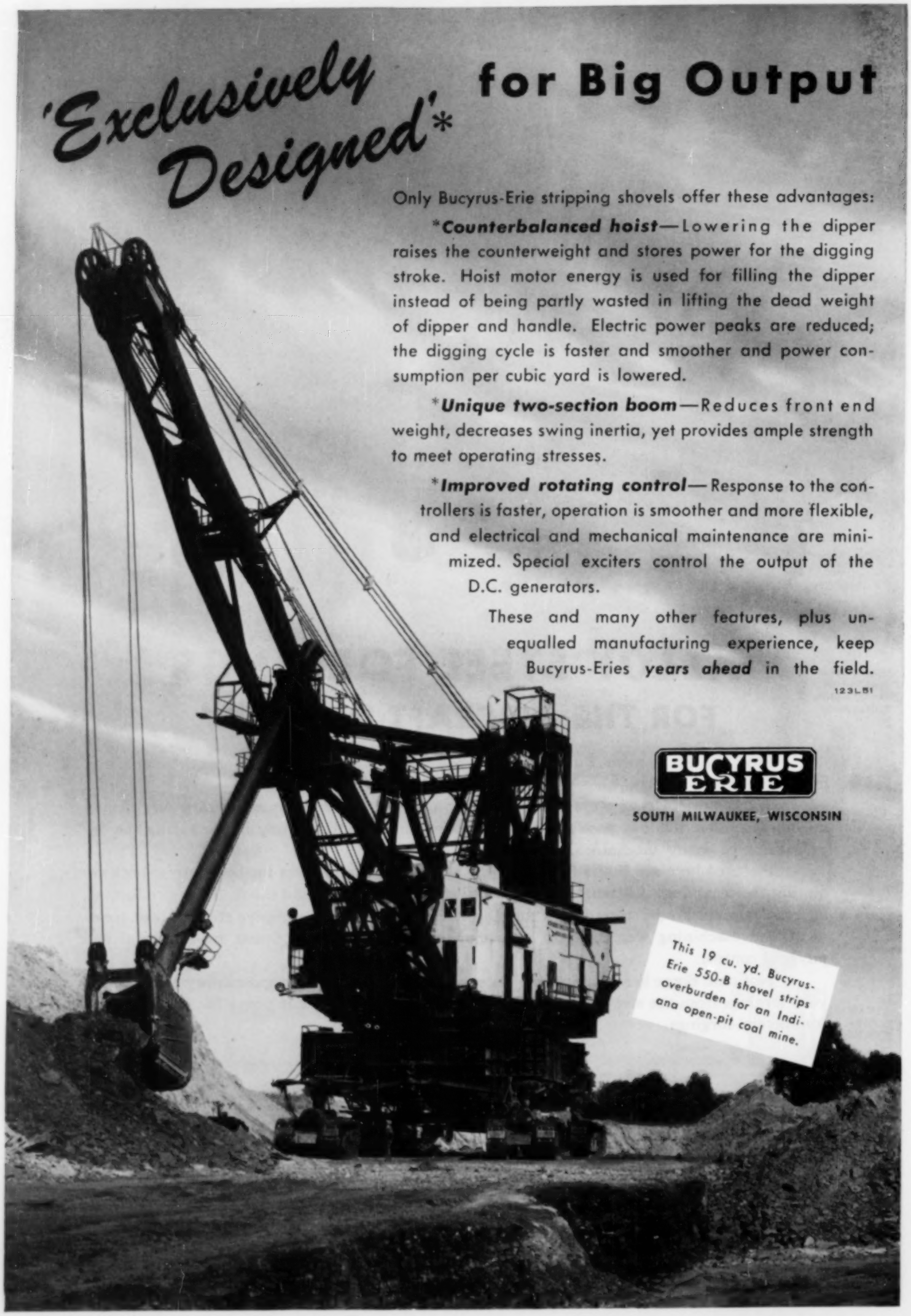
Pictured here are shafts for turbo-jet engines and rotor shafts for helicopters; both requiring the maximum in strength and resistance to fatigue, wear and shock. Their production, here at National Forge, started with the steel itself, and through successive steps of heat treatment and machining were brought through our plant under the closest metallurgical and physical control.

National Forge has complete facilities and assumes the whole responsibility of producing your forgings from the steel through finish machining. This service is yours for aircraft or for commercial forgings.

NF

NATIONAL FORGE AND ORDNANCE COMPANY

IRVINE, WARREN COUNTY, PENNSYLVANIA



'Exclusively Designed'* for Big Output

Only Bucyrus-Erie stripping shovels offer these advantages:

*__Counterbalanced hoist__—Lowering the dipper raises the counterweight and stores power for the digging stroke. Hoist motor energy is used for filling the dipper instead of being partly wasted in lifting the dead weight of dipper and handle. Electric power peaks are reduced; the digging cycle is faster and smoother and power consumption per cubic yard is lowered.

*__*Unique two-section boom*__—Reduces front end weight, decreases swing inertia, yet provides ample strength to meet operating stresses.

*__*Improved rotating control*__—Response to the controllers is faster, operation is smoother and more flexible, and electrical and mechanical maintenance are minimized. Special exciters control the output of the D.C. generators.

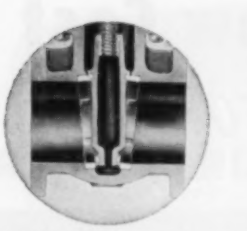
These and many other features, plus unequalled manufacturing experience, keep Bucyrus-Eries ***years ahead*** in the field.

123L51

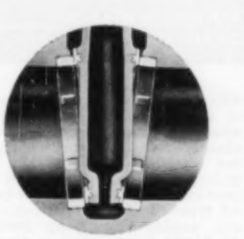
BUCYRUS ERIE

SOUTH MILWAUKEE, WISCONSIN

This 19 cu. yd. Bucyrus-Erie 550-B shovel strips overburden for an Indiana open-pit coal mine.



Straight-Flow Port Design reduces fluid turbulence to a practical minimum.



Seat Rings of end-seated type are screwed into the body.

Sure-Grip Malleable Handwheel for non-skid gripping even with heavy gloves.

WALWORTH

iron body gate valves

with screwed or flanged ends

6
WALWORTH
6
125 WSP
200 WOG
WALWORTH
6
WALWORTH
6
125 WSP
200 WOG
WALWORTH

... *8 Outstanding Features*

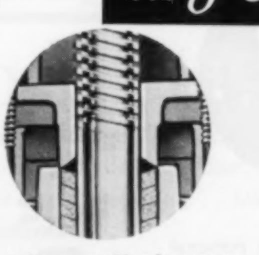
For complete information on these new Walworth Iron Body Valves, see your local Walworth distributor, or write for bulletin 106.

WALWORTH

valves and fittings

60 EAST 42nd STREET NEW YORK 17, N. Y.

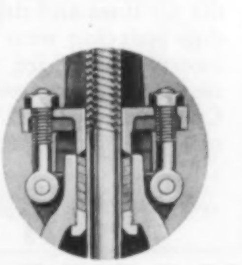
DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD



Brass Liner on Glands assures greater resistance to corrosion and scoring.

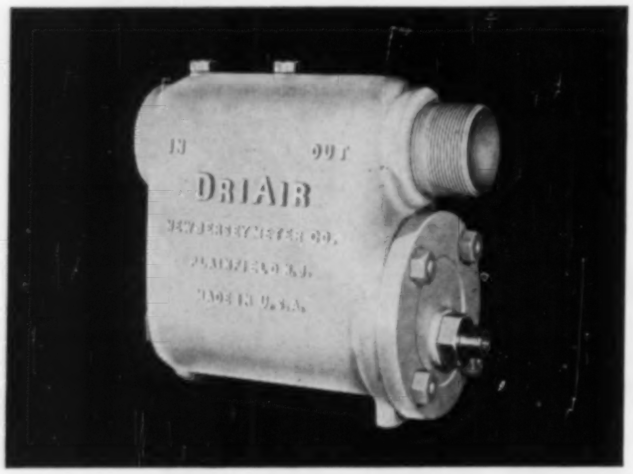
Bronze Back-Seat Bushings in bonnets of OS&Y valves.

Solid Web Type Disc in OS&Y valves for greater strength and longer service.



Hinged Gland Eye-Bolts on OS&Y valves permit faster, easier repacking under full pressure.

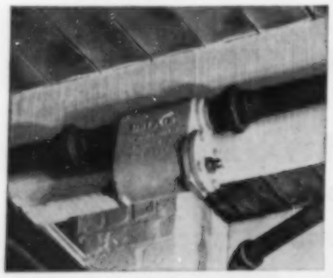
DEPENDABLE PNEUMATIC SERVICE



WHEN EQUIPMENT IS PROTECTED BY

DRIAIR

A COMPLETE SELF-CONTAINED UNIT



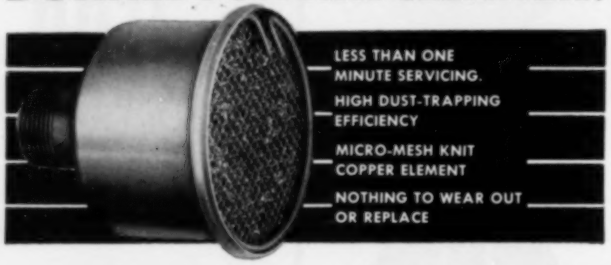
DriAir may be installed by suspending it from the piping, without any other support, or may stand on the floor near equipment being protected.

DRIAIR speeds production by separating and automatically ejecting the condensed water and oil from the air. DriAir collects dirt and rust from the air lines and delivers clean dry air to the tools, thus reducing wear and prolonging their life. All internal parts are made of bronze or copper—resistant to corrosion and practically permanent. Copy of Bulletin DA fully describing the operation of DriAir sent on request.

NEW JERSEY METER COMPANY

PLAINFIELD, NEW JERSEY

NEW! Low Cost *Micro-Mesh* DONALDSON AIR CLEANER!


LESS THAN ONE MINUTE SERVICING.
HIGH DUST-TRAPPING EFFICIENCY
MICRO-MESH KNIT COPPER ELEMENT
NOTHING TO WEAR OUT OR REPLACE

No Tools Required for Servicing

To service, squeeze snap ring together with fingers, removing ring and outer screen. Lift out element . . . wash in kerosene or other solvent. Re-oil and re-insert in cleaner body and replace screen and snap ring. Body of air cleaner need not be removed.

Efficient . . . compact . . . simple to attach and service . . . the new Donaldson Micro-Mesh air cleaner meets every qualification for installations where air requirements are moderate, yet its cost is less than that of oil-washed types. It filters efficiently at any angle, simplifying design problems. Dust entering cleaner is trapped on an oil-wetted filter element, knit from a continuous strand of crimped copper ribbon. Uniform in density, the filter element is placed in the deep-drawn, terne-plate body under slight compression. It will not break down, shift or sag.

Sample Cleaner Sent On Request

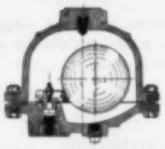
DONALDSON COMPANY INC.

666 PELHAM BLVD. • ST. PAUL 4, MINNESOTA

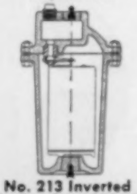
No Moisture Removal System is Complete . . .

without Economical Armstrong Air Traps

No. 71 Snap Action Trap $30.00



No. 21 Ball Float Trap $11.00



No. 213 Inverted Bucket Trap $20.75

KEEP your expensive moisture removal equipment at top efficiency—automatically drain these vital units of the moisture they collect with low cost Armstrong Air Traps. Armstrong traps on separators, aftercoolers, etc., save you air, time and labor, eliminate human failure.

Ruggedly built, these units are available in three types, ball float, snap action or inverted bucket models to give you best service for a given condition.

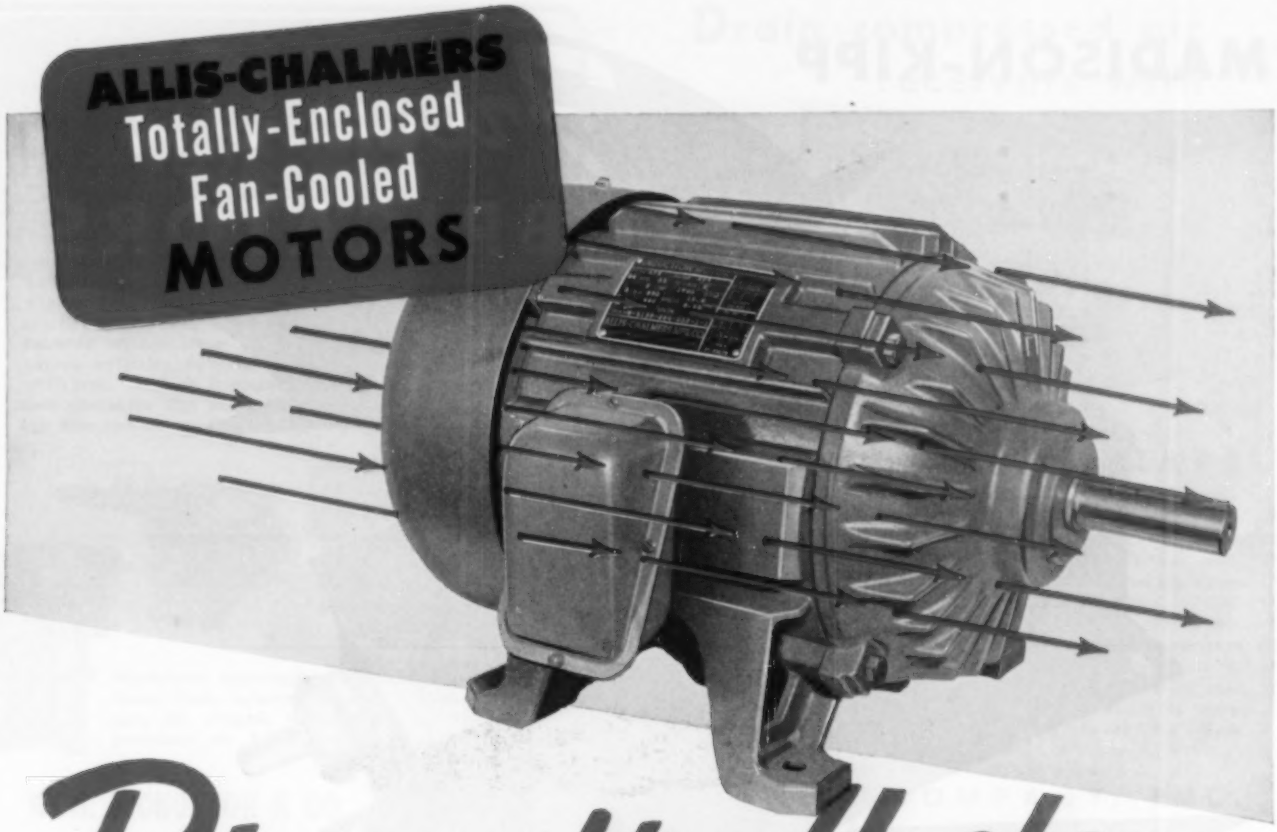
Bulletin No. 1433 gives the details.

Local stocks mean quick delivery. Act today.

ARMSTRONG MACHINE WORKS

885 Maple St. • Three Rivers, Michigan

ARMSTRONG *Air* TRAPS



Blows itself clean as a Whistle!

DIRT IS CARRIED AWAY by cooling air blown over the ribbed cast iron frame and bearing housings of this new Allis-Chalmers tefc motor. That means less motor cleaning . . . inspection . . . overhaul!

Concealed air passages and pockets have been eliminated. Dirt can't build up to cause overheating. And as for oily dirt that sticks — just wipe or blow it off.

Studies show that on most applications, totally-enclosed fan-cooled motors more than pay back their extra cost in reduced maintenance. And this new Allis-Chalmers Type APZ tefc motor makes maintenance costs lower than ever before.

Rigid Construction

The frame is cast iron which has high resistance against corrosion and distortion. Bearings are pre-lubricated at the factory and should need no attention for years. Tapped holes with pipe plugs to permit regreasing and to provide grease relief are standard equipment.

Get All The Facts

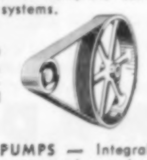
The new Allis-Chalmers Type APZ totally-enclosed fan-cooled motor is built in all NEMA standard frame sizes from 224* to 505. Also in explosion-proof type. Your A-C Authorized Distributor or District Office has complete information. Call today, or write Allis-Chalmers, Milwaukee 1, Wisconsin. Ask for Bulletin 51B7225.

A-3427

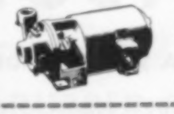
Sold . . .
Applied . . .
Serviced . . .

by Allis-Chalmers Authorized Dealers, Certified Service Shops and Sales Offices throughout the country.

CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.



TEXROPE — Belts in all sizes and sections, standard and *Vari-Pitch* sheaves, speed changers.



PUMPS — Integral motor and coupled types from 3/4 in. to 72 in. discharge and up.

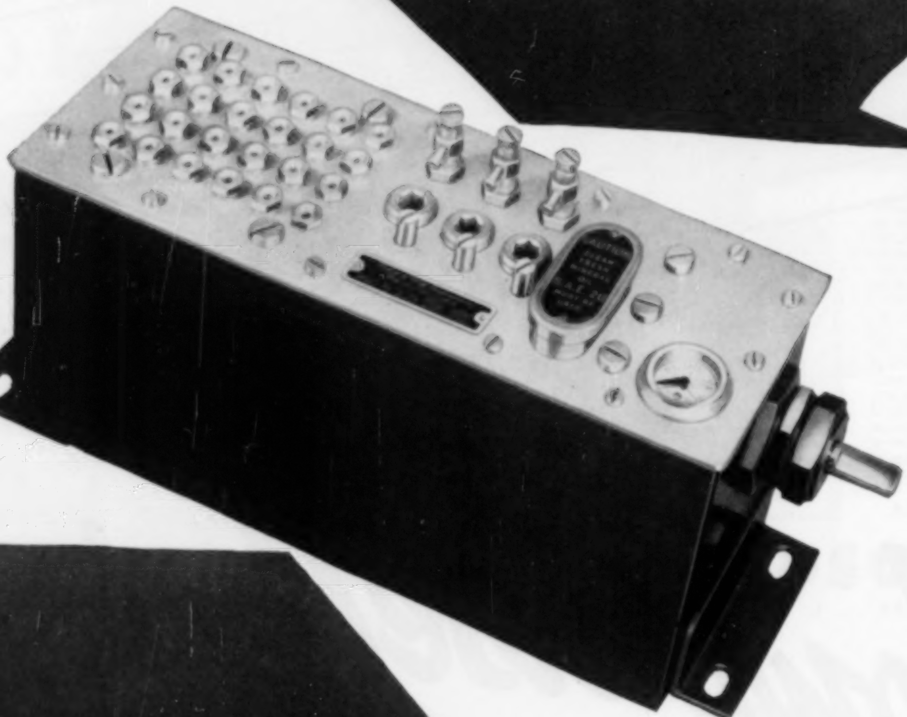
Texrope and Vari-Pitch are Allis-Chalmers trademarks.

ALLIS-CHALMERS

*Similar design non-ventilated motors Type APK, also available in frames 203 to 224 inclusive.

MADISON-KIPP

Fresh Oil LUBRICATORS



THE MOST DEPENDABLE OILING SYSTEM EVER DEVELOPED!

MEASURED FEED DROP BY DROP FED UNDER PRESSURE!

MACHINE performance is in direct relation to the quality of the oiling system! And that's why builders of America's finest machine tools, work engines and compressors specify Madison-Kipp "Fresh Oil" Lubricators as original standard equipment . . . because they provide the most dependable oiling system ever developed . . . measured feed, drop by drop, fed under pressure. There are six models to meet almost every application requirement. Illustrated is the Model FD. Please address all inquiries to the home office in Madison, Wisconsin

MADISON-KIPP CORPORATION

202 WAUBESA STREET, MADISON 10, WIS., U.S.A.

ANCIENS ATELIERS GASQUY, 31 Rue du Marais, Brussels, Belgium, sole agents for Belgium, Holland, France, and Switzerland.

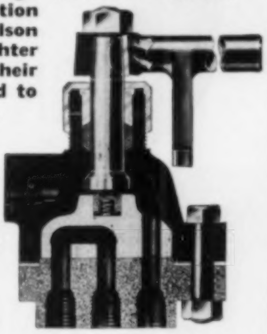
WM. COULTHARD & CO. Ltd., Carlisle, England, sole agents for England, most European countries, India, Australia, and New Zealand.

- *Skilled in* DIE CASTING *Mechanics*
- *Experienced in* LUBRICATION *Engineering*
- *Originators of Really High Speed* AIR TOOLS

Nicholson Control Valves

SET RECORDS for LONG LIFE

In a wide range of plants—steel, metal working, processing, etc.—many Nicholson cylinder control valves have now been in continuous use for over 25 years. Their capacity for longer leak-free service is confirmed by many installation records which show Nicholson valves actually become tighter with use. This is because their non-corrosive flat discs tend to lap themselves on the seats.

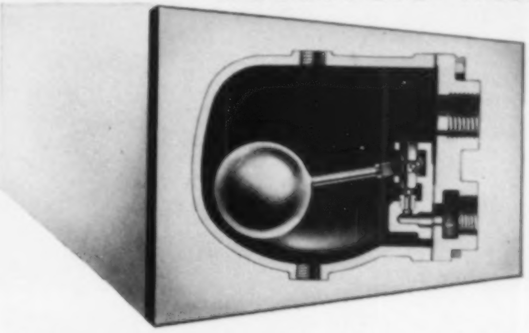


Nicholson standard and special valves in lever, foot, solenoid, motor types; for air, gas, oil, steam, water; size 1/4" to 2½"; pressure to 5,000 lbs. CATALOG 1250.

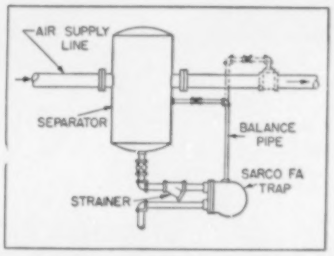
W. H. NICHOLSON & CO. 180 OREGON ST. WILKES-BARRE, PA.

Sales and Engineering Offices in 53 Principal Cities

Drain compressed air receivers with



SARCO FA DRAIN TRAPS



Type FA Trap draining separator.

. . . also your intercoolers, aftercoolers and separators. These traps automatically release condensate as it forms . . . without the waste of air that occurs when blowdown valves are used. New technical bulletin No. 5-CA offers many suggestions as to how you can increase the EFFECTIVE capacities of your air compressors. Write today for your free copy. No obligation . . . of course.

513

sarco COMPANY, INC.
Represented in Principal Cities
Empire State Building, New York 1, N. Y.
SARCO CANADA, LTD., TORONTO 5, ONTARIO

BULK STORAGE

Made Easy!

At iron mine, a large tonnage of waste rock is processed daily for sale as concrete aggregate and railway ballast. Several 1½ cu. yd. Sauerman Scrapers stock out the material in long, high piles and reclaim as needed to loading hoppers.

with

SAUERMAN POWER SCRAPERS

Stockpiling raw or processed materials, crushed ores, stone, clay, chemicals, salt, sugar, fertilizers, coal, etc. - indoors or outside - it's all the same to the versatile Sauerman Power Drag Scraper. And just one easily-trained man can do your particular job quickly, efficiently - at considerable savings to you!

Mine, smelter and mill operators the world over have found that Sauerman equipment soon pays for itself.

Write now for new Bulk Storage Catalog!

CRESCENT Scoops
⅓ to 15 cy. yd.

. . . .

Streamlined Crescent bottomless bucket is exclusive feature of Sauerman machines. Light in weight, it moves heaping loads without requiring heavy line-pull.

SAUERMAN BROS., INC.
548 S. Clinton St., Chicago 7, Ill.

SAUERMAN LONG RANGE MACHINES

Resists Every Service Hazard LONGER!

"SUBWAY"® AIR HOSE

"Standard of Quality"

Wrapped Duck Construction

"SUBWAY" is built for one particular purpose . . . to keep heavy-duty air tools *on the job longer* by providing highest resistance to all factors contributing to hose failure. Outstanding in strength, toughness and durability, yet extremely flexible, easy to handle. Sizes ½" to 1¼", in maximum lengths of 50 feet.

PARTICIPATING IN THE MANAGEMENT AND FINANCING OF KENTUCKY SYNTHETIC RUBBER CORPORATION

Contact Our Nearest Branch for Details

GOODALL RUBBER COMPANY
GENERAL OFFICES, MILLS and EXPORT DIVISION, TRENTON, N. J.
Est. 1870
Branches: Philadelphia · New York · Boston · Pittsburgh · Chicago · Detroit · St. Paul · Los Angeles
San Francisco · Seattle · Portland · Salt Lake City · Denver · Houston · Distributors in Other Principal Cities

ON TOP

or

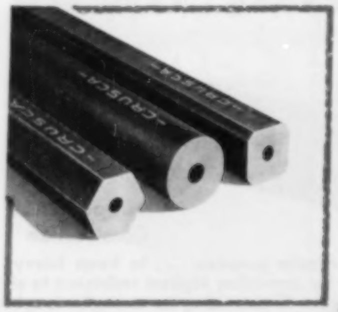
UNDERGROUND

it's

CRUCIBLE HOLLOW DRILL STEEL

all the way

Whether driving a tunnel or clearing a mountain pass — tough Crucible Hollow Drill Steel gets the job done better, faster — at lower cost per foot drilled. This quality steel is built to take the punishment of around-the-clock operation of modern, high air-pressure rock drills. And you have the assurance of minimum breakage . . . and an end to expensive bit loss.



That's because of Crucible's rigid *pre-testing* of every *lot* of Crucible Hollow Drill Steel. What's more, Crucible Hollow Drill Steel is backed by the experience of quality steelmakers. Then too, field metallurgists with broad background on *your* job are available — should you need them.

Insure the quality of your job — cut costs — use Crucible Hollow Drill Steel.

CRUCIBLE first name in special purpose steels

51 *years of* *Fine* *steelmaking*

HOLLOW DRILL STEEL

CRUCIBLE STEEL COMPANY OF AMERICA, GENERAL SALES OFFICES, OLIVER BUILDING, PITTSBURGH, PA.

REX HIGH SPEED • TOOL • STAINLESS • ALLOY • MACHINERY • SPECIAL PURPOSE STEELS

it's as quick and easy as it looks

TO CARRY

TO SET UP

TO DRILL

that's why the **JL-4 JACKLEG** can increase your footage up to 50% or more

Take the JL-4 Jackleg into the smallest tunnel or tightest corner—set it up in an instant—collar the hole—and let the JL-4 do *all the work*. It supports the Jackhamer, absorbs the recoil, and feeds the drill uniformly into the rock.

Elimination of set-up time and faster drilling speed with smaller Carset Jackbits can increase footage as much as 50% in scram drifts, coyote holes, slashing in stopes, square set mining and sublevel work.

The new JL-4 embodies many new features for easier, more efficient operation. Feed legs up to 4′ long plus extension pieces permit the use of longer steels—an improved pressure valve gives better control of feed rates—a finger-tip bleed-off valve gives instant pressure release—renewable clamping plates and a bayonet connection simplifies mounting the drill on the leg. The JL-4 is the result of 12 years experience in manufacturing and applying Jacklegs, in worldwide installations.

For complete information, see your nearest I-R representative. He is a skilled specialist in the application and servicing of every type of rock drilling equipment. He is backed by factory branch stocks and service in your vicinity.

This Complete I-R Combination has **NO EQUAL** for fast, efficient small-hole drilling

JL-4 JACKLEG
with
J-40 JACKHAMER
and
SERIES 113
CARSET JACKBITS

Comparative Tests—both in the factory and on the job—have proved that this I-R Jackleg Combination out-performs other equipment of its type in drilling speed. Air consumption and maintenance costs are exceptionally low.

Ingersoll-Rand
11 BROADWAY, NEW YORK 4, N. Y. 674-5

CARSET JACKBIT
SET WITH CARBOLOY INSERTS

ROCK DRILLS • COMPRESSORS • AIR TOOLS • CENTRIFUGAL PUMPS • TURBO BLOWERS • CONDENSERS • DIESELS • GAS ENGINES

Hard work's a breeze for air compressor on TIMKEN® bearings

THERE'S air to spare with this Timken® bearing equipped Ingersoll-Rand Type 40 compressor on the job at a rock crushing plant in El Paso, Texas.

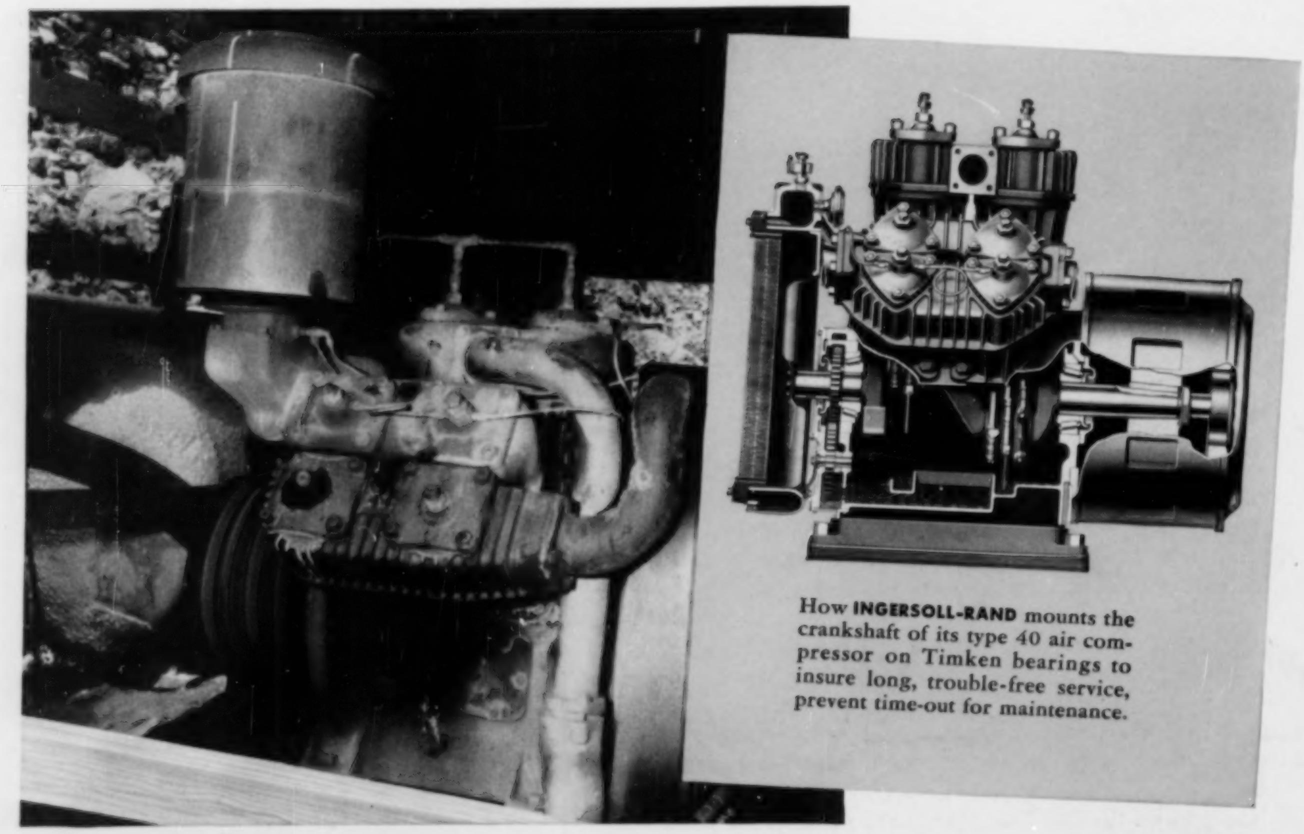
One reason why: the crankshaft is mounted on Timken tapered roller bearings to prevent costly breakdowns and maintenance delays.

Timken bearings keep the crankshaft in positive alignment, practically eliminating deflection and end-play. Wear on moving parts is cut to a minimum. What's more, Timken bearings permit tighter closures that keep dirt and moisture out, keep the lubricant in.

Because of their tapered construction, Timken bearings carry both radial and thrust loads in any combination. Line contact between rollers and races gives extra load-carrying capacity. True rolling motion and an incredibly smooth surface finish makes friction negligible. And Timken bearings are made of the finest steel ever developed for tapered roller bearings—Timken fine alloy steel. Under normal conditions, they'll last the life of the compressor.

No other bearing gives you *all* the advantages you get with Timken bearings. Specify them in the machines you build. Look for them in equipment you buy. Make certain every bearing is stamped with the trade-mark "Timken". The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ont. Cable address: "TIMROSCO".

This symbol on a product means its bearings are the best.



How **INGERSOLL-RAND** mounts the crankshaft of its type 40 air compressor on Timken bearings to insure long, trouble-free service, prevent time-out for maintenance.

FINISHED TO CLOSER TOLERANCES

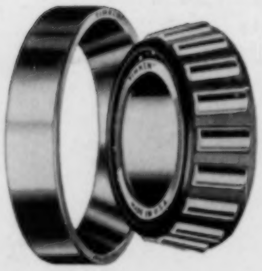
Finishing to incredible smoothness accounts for much of the precise, smooth rolling performance of Timken bearings. This honing operation is typical of the amazingly accurate manufacturing methods at the Timken Company.

The Timken Company is the acknowledged leader in: 1. advanced design; 2. precision manufacturing; 3. rigid quality control; 4. special analysis steels.

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

TAPERED ROLLER BEARINGS



NOT JUST A BALL ○ NOT JUST A ROLLER ▭ THE TIMKEN TAPERED ROLLER ▭ BEARING TAKES RADIAL AND THRUST → ← LOADS OR ANY COMBINATION